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TREATISE ON RUPTURES.

CHAPTER I.

General description of Ruptures—Enumeration of the various species—Formation and principal varieties of the complaint—Anatomy and changes of the Hernial Sac.

IF there be any disorder, which, from the frequency of its occurrence, and from the variety of forms under which it is presented to the care of the surgeon, demands more than others his minute and attentive investigation, in every part of its history and treatment, such, assuredly, is that which forms the subject of the following pages. Surgeons of great experience in the treatment of ruptures have estimated, that one-eighth,* or one sixteenth of the human

* See ARNAUD, in his preface ; this statement is adopted by GIMBERNAT, p. 1. Mr. TURNBULL, Surgeon to the London Rupture Society, asserts, on the authority of “ the most diligent and general inquiries throughout the kingdom,” that the proportion of the ruptured to the whole population, is one in fifteen, including persons of all ages and both sexes.—*Manual, &c. Introduction*, p. 10. JUVILLE, a celebrated truss-maker in Paris, found that the number of subjects with hernia was about one-thirtieth of the population in Germany and the North of Europe ; one fifteenth in Italy and Spain ; and one-twentieth in France and England.—*Traité des Band. Hern.* p. 21, 22.

My readers will probably not rely implicitly on these, or any similar statements. They appear to be manifestly exaggerated. Mr. LOUIS ascertained the number of patients with herniæ in the different hospitals of Paris. We should expect to find a greater proportion here than among mankind at large,

race is afflicted with this complaint; which affects, indiscriminately, persons of both sexes, of every age, condition, and mode of life.

It is true, indeed, that a hernia, if properly managed, is not immediately dangerous to the patient; does not affect his health, nor materially diminish his enjoyments: but it is a source of constant danger, since violent exercise or sudden exertion may bring it from a perfectly innocent state into a condition which frequently proves fatal. The ordinarily harmless nature of these swellings increases the patient's risk, by averting suspicion, and leading him to neglect the means of prevention and security.

The numerous situations in which ruptures may occur, the disorders with which they may be confounded, the different states in which their contents exist, and the minute anatomical knowledge necessary for understanding thoroughly these several points, and for performing the operations re-

since these very disorders compel many to seek relief at such institutions; yet it will be seen, that the proportion is not so high as the quotations above make it. Of 7,027 females in the Salpêtrière, 220 were ruptured, that is, about 1 in 32; at the Bicêtre, 212 out of 3,800 men, or about 1 in 18; at the Invalides, 142 out of 2,500, or 2,600 males, or 1 in 29 nearly; and of the children at the Hôpital de la Pitié, 21 in 1,037, that is, about 1 in 50.—*Memoires de l'Acad. de Chir.* tom. v. *Supplement*, p. 885.

Among those who are relieved by charitable institutions, the proportion of the ruptured varies so much in different instances, that we can draw no general conclusions. Thus Dr. MONRO states, that of 10,792 dispensary patients in Edinburgh, 95 were furnished with trusses; *i. e.* 1 in 113 nearly.—*Morbid Anatomy of the Human Gullet*, p. 366. Of 3,712 persons received into the Newcastle Infirmary, 132 had ruptures, or 1 in 28.—*Ibid.* 366. Of 305 men, women, and children in the workhouse at Manchester, 20 were ruptured, or 1 in 15; and in 1,486 surgical out-patients in the same place, there were 192 ruptured, or nearly 1 in 8.—*Ibid.* p. 367.

As men labouring under rupture are not received into the military service of any country, the returns of examinations, comprising the numbers of recruits or conscripts rejected on account of this infirmity, enable us to judge in what proportion of young men this complaint is found. A return of Dr. VERSTURME, inspector-general of the German legion, shows that of 40,460 recruits examined between March 1796 and December 1810, 365 were rejected for ruptures, or 1 in 110. During the same time, 2,728 were invalided, of whom 316 were so on account of ruptures.—*Ibid.* 367. Of 12,835 recruits inspected in Dublin, from December 1824 to December 1827, 116 were rejected on account of being ruptured, or 1 in 110. Laxity of the abdominal rings is assigned as a reason for the rejection of 133 more.—MARSHALL, *Hints to Young Medical Officers; Appendix*, p. 187—193. The French conscription for the years 1831 to 1833, inclusive, amounted on the average, to 286,429, of whom 3,948 were exempted for herniæ, being a ratio of 1.3 per cent.—Dr. KNOX, *Observations on the Statistics of Hernia*; in *Edin. Med. Surg. Journal*, v. xlvi. p. 88, quoted from the *Athenæum*, No. 435. Dr. KNOX states that he carefully examined 86 persons of the lower orders of various ages, taken consecutively, without finding a single case of Hernia.—*Ibid.* p. 85.

quired under various circumstances, bestow a peculiar importance on the subject, and require to be studied with anxious interest by every man, who wishes to practise his profession with honour to himself, and advantage to his patient. The treatment of ruptures demands, from all these circumstances, as great a combination of anatomical skill, with experience and judgment, as that of any disorders in surgery.

SECTION I. —GENERAL DESCRIPTION OF RUPTURES.

UNDER the technical denomination of *hernia* are included all cases, in which the viscera contained in a circumscribed cavity are protruded from their natural situation, through a normal or newly-formed aperture in the parietes; except where this change of situation is the immediate result of a penetrating wound, or where it takes place at one of the natural outlets.

Surgeons have established three general divisions of *herniæ*, according to the three principal circumscribed cavities of the body; *viz.* those of the head, chest, and abdomen. The latter only are the subject of this work; and they are by far the most numerous class. The mobility and varying bulk of the viscera; the pressure which they experience, in all considerable efforts and motions of the body, from the muscles which in great part surround and enclose them; and the natural openings of the cavity, are circumstances greatly facilitating the origin of these complaints.

As hernial protrusions are of extremely rare occurrence in the head and chest, the term *hernia*, when used simply, is considered equivalent to the English word *rupture*, and as applicable to the abdomen only. Thus, a *hernia*,* or *rupture*, according to the common acceptation of these terms, is a disease consisting in the passage of any part or parts naturally contained in the abdomen, out of that cavity, with the exception already mentioned.

* The origin of this word has been variously explained: some derive it from *ερνος*, a branch; others, from *hæreo*, or the old adjective *hernius*, hard or rugged. The Greek *κηλη*, a swelling, from which the termination, *cele*, in the nomenclature of ruptures, is derived, has been drawn from *κηλεω*, *noceo*, or *χαλαω*, *laxo*.

Herniæ have been divided into *true*, and *false* or *spurious*. The former are those protrusions of the abdominal contents, in which the parts carry before them a portion of the serous membrane lining the cavity; the latter are the cases, in which the viscera pass into a neighbouring serous cavity, as in congenital and diaphragmatic ruptures. Again, various affections of the testis, its coats and vessels, have been denominated *false*, in contradistinction to those above defined as *true* herniæ. The former diseases are attended with swelling in the groin and scrotum, the seat of the most frequent kind of ruptures. The Greek word, κηλη, a tumour, forming part of the compound epithet applied both to the diseases affecting the testis and spermatic cord, and to the several ruptures, denotes the circumstance of enlargement, which is a character common to all these various cases. If the term hernia were used in the same general way as the Greek κηλη, it would be necessary to employ the additional epithets of true and false, in order to avoid confounding together complaints so widely different in nature.

Herniæ have also been distinguished as *external* and *internal*, the former being protrusions of the abdominal contents, generally attended with an obvious tumour, formed in the mode indicated by the definition; while the latter are instances of strangulation, caused by certain internal changes, not indicated by external swellings; as when the bowels pass through an opening in the diaphragm, or into a preternatural cavity formed in either of the peritoneal duplicatures, or when they are confined by preternatural cords or adhesions. Since the protruded parts may become strangulated in these various cases, as in common ruptures, they have been regarded as a species of hernia; I therefore notice them in this work, although they do not come under the definition of hernia. When the protruded parts remain in the opening, without showing themselves externally, the hernia is called *incomplete*; if they come through entirely, and form an external swelling, it is called *complete*.

Except in some cases of rare occurrence, the parts carry before them a portion of peritoneum, which surrounds and encloses them in their new situation, and is called the *hernial sac*; they pass through some natural opening of the abdominal parietes, as the inguinal or crural canal, or the navel; or they are forced between the muscular or tendi-

nous fibres, in some part where there is ordinarily no perforation; or they escape at some point, which has been weakened by a wound, or by disease; and, in the great majority of instances, they form in the part, into which they are protruded, a tumour visible externally. Thus, the parts composing a rupture are contained in a cavity, continuous with that of the abdomen, and lined by a prolongation of its serous membrane.

At the immediate exit of the tumour from the abdomen, the size of the cavity is limited by that of the opening, which is in most cases tendinous, and therefore unyielding. Its growth is opposed externally, in most cases, only by soft and yielding parts, such as thin fascia, cellular membrane, and integuments; it consequently expands so as to form a bag, of various size and figure, communicating with the abdomen by a comparatively small opening, called the *mouth of the sac*. The contracted part, between the mouth and the point at which the membrane begins to expand, is the *neck*; the most distant point from the abdomen, which is generally at the same time the largest, is the *fundus*; and the portion between the latter and the neck constitutes the *body* of the sac.

The contents of a rupture are some part or parts ordinarily contained in the abdomen; and commonly the omentum, the intestine, or both together. These are the most movable viscera, and occupy the front and lower part of the belly; their relative position explains why, in a mixed case, the latter are generally covered by the former.

The small intestine, from the greater looseness of its connexion, is more frequently protruded than the large; and the ileum more frequently than the jejunum, in consequence of its greater proximity to the ring and crural arch. A part only of the diameter of the tube is sometimes included in a hernia; any larger quantity may descend, from a single fold to the whole moveable portion of the canal.

Protrusions of the large intestine consist, generally, either of the cœcum, or the arch or sigmoid flexure of the colon: as these are the least fixed portions of the canal. When the former part descends, it is ordinarily, as we should expect, on the right side; when the latter, on the left. Yet the cœcum, with its appendix, has been seen in ruptures of the left,* the sigmoid flexure in those of the

* SANDIFORT, *Tabulæ anatomicae situm viscerum; &c. depingentes*. Expl. of

right side :* and both these portions of the gut have been protruded at the navel.† When we consider that the intestines may descend to the knees, dragging even the stomach to the pubes, and that the bladder, which appears so firmly fixed in the bottom of the pelvis, may, without any separation of its connexions, pass through the ring, and descend into the scrotum, we shall be convinced, that the natural position of an organ cannot, of itself, enable us to determine at which opening it may be protruded.

Adipous matter is generally deposited in large quantity in the omentum of fat and elderly persons; and in this state it escapes very readily from the cavity.

Other abdominal viscera, besides the intestines and omentum, may be protruded. The urinary bladder sometimes passes through the abdominal ring. The ovaries‡ and uterus,§

tab. 5 and 6. CAMPER found the cœcum in an inguinal hernia of the left side, where there was also a hernia on the right side.—*Demonstr. Anat. Pathol.* part ii. p. 17. MAUCHART witnessed a similar fact. *De hernia incarcerata*, in HALLERI, *Disp. Chir.* tom. iii.

* LASSUS, *Méd. Operat.* tom. i. p. 173. PELLETAN, *Clinique Chirurgicale*, tom. iii. p. 345.

† SANDIFORT, *Obs. Pathol.* cap. iv. PALLETTA, *Nova Gubernaculi testis Descriptio*.

‡ Each ovary in an inguinal hernia; POTT's *Works*, v. iii. p. 329. See also CAMPER, *Rem. sur le Cancer*; quoted in the French translation of RICHTER, p. 109, note b. The ovary in ischiatic hernia; CAMPER, *Demonstr. Anat. Pathol.* lib. ii. p. 17. Two cases are quoted in CHAP. ix. SECT. v., on the inguinal hernia of females; in one of which the Fallopian tube and ovary, in the other, the ovary, tube, and broad ligament had passed through the abdominal ring, and were contained in an external inguinal hernia.

§ Uterus and left ovary in a large inguinal hernia.—CHOPART & DESAULT, *Tr. des Mal. Chir.* tom. ii. p. 3.—The uterus, Fallopian tubes, ovaries, and part of the vagina, were found, together with some omentum, in the large crural hernia of a patient who died in the Salpêtrière, at the age of eighty-two. The rupture began at the age of forty-two, after the birth of the eighth child, and did not exceed a hen's egg for thirty-two years; but at the end of that time increased considerably. She was subject, in consequence of it, to attacks of colic, nausea, &c. Several times in the latter years of her life, it swelled and burst, discharging a clear serous fluid. The tumour was five inches long and four broad, and hung between the thighs. The protruded parts adhered firmly to the sac.—*Journal de Méd. Chirurg. Pharm. &c. par M. LEROUX*, tom. xxxv.

This seems to be the case quoted by BOYER, in his *Traité de Mal. Chir.* tom. viii. p. 382, from the *Bulletin de la Faculté de Méd. de Paris*; tom. i. p. 1, as having been examined and described Mr. LALLEMAND. The latter gentleman met also with a protrusion of the uterus at the abdominal ring in a patient of seventy-one. At the age of fifty this woman perceived a tumour in the groin, which increased rapidly until it had attained a length of four or five finger-breadths, being pyriform, and attended at first with great sensibility to the touch, which gradually went off. The whole of the uterus, with the right Fallopian tube and ovary, were contained in a thick hernial sac.—*Mem. de la Soc. Méd. d'Emulation*; 3^{me} année, p. 323.—BOYER, *ibid.*

the spleen,* stomach,† and kidney,‡ have been rarely seen in ruptures.

When the rupture is small, and subject to no hurtful influences, or when the parts being protruded only occasionally, descend and return easily, they undergo no change of structure, and execute their functions perfectly. Often, however, they experience more or less injurious consequences from their unnatural situation; and it will be a principal object of this work to explain the causes, nature, and remedies of such alterations.

Thickening, enlargement, general increase of bulk, and slow inflammation of parts producing adhesions, are the effects of long residence in large ruptures.§ Effusions of fluid, and of the new matter, called coagulable lymph, which is organised into adventitious membranes, must be referred to the same cause.|| More active inflammation, even to the highest degree, and mortification, result from the mechanical pressure which takes place in strangulation.¶

So long as the viscera descend and return freely, the rupture is said to be *reducible*. When, after long residence in the tumour, they have either increased so much in bulk, or have contracted such adhesion to each other, or to the hernial sac, as to become incapable of being returned, although they experience no pressure from the ring, it is

It has been asserted, that the uterus contained in a hernia may become impregnated; and two cases are related, in which, under such circumstances, it was necessary to bring the child into the world by an incision of the tumour. The infants lived, but the mothers died; one in twenty, the other in three days. The very circumstantial narratives of these cases leave no doubt respecting the principal facts; but it is still uncertain whether the affection was hernia, properly so called; and it is tolerably clear, that the uterus was not protruded either at the inguinal or crural ring. See SENNERTI *Opera*, Lugd. 1650; tom. iii., p. 39; and HILDANI, (GUL. FAB.) *Obs. Chir.* lib. iii.

* RUYSCH *Advers.* Dec. 2.

† PROFESSOR LALLEMAND found nearly half of the stomach in an inguinal hernia of the right side; and deposited the specimen in the museum of the Faculty of Medicine at Paris. *Dict. de Med. et de Chir. pratiques*; tom. ix. p. 577. A case, in which one-third of the stomach was found in a large inguinal hernia, is mentioned in chap. v. towards the beginning.

The stomach has not unfrequently formed part of the protrusion in hernia of the diaphragm. See chap xxv.

‡ DR. MONRO says, that his father saw a boy six months old, in whom both kidneys passed through large apertures in the muscles of the loins, and were covered by the common integuments only, and the apertures were so large, that the kidneys could be easily reduced, but were with difficulty retained within the abdomen.—*Morbid Anatomy of the Stomach*; p. 379.

§ See the third section of this chapter, and chap. vii. and xii.

|| See section iii. of this chapter.

¶ See the chapters on strangulated and mortified herniæ.

termed *irreducible*. Such pressure on the protruded viscera, from the opening through which they have descended, as not only prevents their return, but impedes or suspends their functions, excites inflammation in them, or even interferes more or less seriously with their circulation, brings the disease into a state of *incarceration* or *strangulation*; the part, by which that pressure is caused, being usually denominated the *stricture*.

Inflammation may arise in a hernia, independently of stricture. The contents of an *inflamed rupture*, however, will be so far increased in bulk as to be incapable of replacement; and they will probably, from the same cause, experience, secondarily, more or less constriction.

The functions of the protruded parts may be interrupted or impeded without the presence of stricture or inflammation; this condition of the complaint has been called *obstructed hernia*.

The existence of a peritoneal covering is not essential to the notion of a hernia. That of the bladder and of the cœcum may be formed without a sac;* and ruptures of the bladder in general, as well as the bubonocœles, which contain either the cœcum or the sigmoid flexure of the colon, differ from others with respect to their sac.†

The contents of a rupture may be found immediately under the skin, when the hernial sac has been burst by a blow;‡ but this is an unfrequent occurrence.

It has been asserted, that other herniæ, under circumstances of rare occurrence, do not possess peritoneal sacs. The ancients believed such cases to be very common, and supposed the protrusion to take place in consequence of an actual laceration of the peritoneum. The English word

* See the chapter on ruptures of the bladder.

† See the chapter on the anatomy of inguinal herniæ, sect. vi.

‡ COOPER, part 1, p. 3. *Supplement au traité de J. L. PETIT, sur les maladies chirurgicales*; p. 113. RUDTORFER, *Abhandlung über die einfachste und sicherste Methode*, &c., b. i. p. 145.

BARON BOYER refers to this head a case, in which he operated, of a man sixty years old, who had had an inguinal rupture from infancy. The patient had long observed, that pressure on the tumour forced it above the ring, so that he was obliged to push the parts from above downwards. The swelling became strangulated, and was found by BOYER extending from the groin towards the navel, and, as he says, manifestly covered only by the skin. A very small portion of the intestine was contained in the hernial sac; the rest had escaped at an accidental aperture, and lay between the skin and the aponeurosis of the obliquus externus. On examination after death, the rupture of the upper part of the sac was ascertained.—*Traité des Mal. Chirurg.* tom. viii. p. 72.

rupture, and the equivalent terms in some other languages, indicate an opinion of this kind, which might naturally arise from a superficial observation of the circumstances frequently attending the origin of the complaint. The older surgeons, conceiving the peritoneum to be incapable of sudden extension to a sufficient degree, distinguished the herniæ of sudden origin from those of more gradual developement, in which they admitted the existence of a sac. In reference to this opinion, as to the different mode of formation, they called the former herniæ by rupture, and the latter herniæ by dilatation. Experience has shown this distinction to be unfounded; and has proved, that ruptures of both kinds have sacs; a conclusion, which correct anatomical views would certainly have suggested. When we consider the texture of the peritoneum, and the mode of its connexion to the abdominal parietes, we cannot fancy the possibility of tearing the membrane by any attitude or motion. This opinion is strengthened by the impunity with which the harlequin and tumbler practise their tricks, throwing their trunks into every contortion, of which the bony fabric will admit; and leads us to regard with suspicion, if not to condemn as fabulous, the case of rupture related by GARENGEOT.* Authors of reputation state the following as cases, in which no sac exists: *viz.* herniæ consequent on penetrating wounds of the abdomen: those which return after an operation; or, where the sac has been destroyed by caustic or other means, with a view to the radical cure. Some add umbilical herniæ; this point will be considered in the chapter on that subject. In the two cases first mentioned the rupture certainly has a sac.

The hernial sac is not in all cases a protrusion of the peritoneum; the parts contained in a congenital rupture are surrounded by the serous membrane of the testicle.

Although a visible external tumour exists in most instances, it is not a universal symptom. Inguinal, femoral, or umbilical ruptures may be so small and deep-seated, as not to be recognisable externally, especially in fat persons. The rupture of the diaphragm is altogether internal.

* A young woman, after throwing her trunk suddenly backwards, felt immediately a considerable pain in the abdomen. GARENGEOT discovered a crural hernia, on which he afterwards operated. It contained omentum, not covered by any sac. *Operations*; tom. i. p. 373.

SECTION II.—ENUMERATION OF THE VARIOUS SPECIES OF RUPTURES.

THE rupture is named either according to its situation in the body, or from the parts which it contains. The groin, scrotum, labia pudendi, bend of the thigh, and navel, are the most frequent seats of these swellings; the omentum and intestines their most common contents.

When the viscera are protruded through the inguinal canal, or through the ring of the external oblique muscle, in either sex, without passing farther than the groin, the case is called a *bubonocoele*, or *inguinal hernia*. As this increases in volume in the female, it descends into the labium pudendi, still retaining the same name. In the male, the increasing tumour extends into the scrotum, and forms an *oscheocoele*, or *scrotal rupture*. If it is formed in the latter sex, before the communication between the peritoneum and the tunica vaginalis testis has been closed, the case is named a *hernia congenita*.

Inguinal herniæ are characterised as *complete* or *incomplete*; as *external* or *internal*, according to differences in their origin and subsequent extension, which will be explained in the ninth chapter, on the anatomy of inguinal ruptures.

The rupture which occurs through the small opening under the pubic extremity of the crural arch, and manifests itself at the bend of the thigh, is called *femoral* or *crural hernia*, or *merocele*.*

The *exomphalos*, *omphalocele*, or *umbilical hernia*, takes place through the round opening of the linea alba, which transmits the umbilical blood-vessels of the fœtus.

In the cases now enumerated, the viscera pass through natural openings of the parietes; but protrusions may occur at any other part of the abdominal region, and they are then called *ventral* herniæ. These are most frequent in the linea alba; and, when taking place above the navel, have been called *herniæ of the stomach*.

Those now enumerated are by far the most common species;† but there are some more rare kinds.

* From *μηρος*, the inside of the thigh, and *κηλη*.

† The comparative numbers of the different kinds of ruptures, and the relative frequency of the complaint generally, as well as that of its various

In the *hernia of the peritoneum*, in either sex, the parts are protruded by the side of the bladder or vagina. A tumour may be formed in any part of the female vagina,

forms in the two sexes, and at different periods of life, are exhibited in the following statement, extracted from the register of the patients relieved by the City of London Truss Society within twenty-eight years.

In 83,584 patients, 67,798 were males, and 15,786 were females.

| Males. | Females. | | | | |
|--------|----------|--|-------|----------------|-------|
| 14006 | 511 | Left inguinal | } | 39419 inguinal | } |
| 24316 | 586 | Right inguinal | | | |
| 278 | 2255 | Left femoral | } | 6210 femoral | } |
| 421 | 3256 | Right femoral | | | |
| 24966 | 286 | Double inguinal | } | - - - | } |
| 169 | 1608 | Double femoral | | | |
| 664 | 2775 | Umbilical | } | - - - | } |
| 209 | 415 | Ventral | | | |
| 1 | 3 | Peritoneal | - - - | - - - | 4 |
| 1 | 4 | Obturator | - - - | - - - | 5 |
| 26 | 46 | have undergone operations | - - - | - - - | 72 |
| 2289 | 1401 | with umbilical and inguinal hernia have been cured | - - - | - - - | 3690 |
| 446 | 243 | with prolapsus ani | - - - | - - - | 689 |
| | 2196 | with prolapsus uteri | } | - - - | } |
| | 37 | with prolapsus vaginae | | | |
| | 159 | with prolapsus vesicae | } | - - - | } |
| 6 | 5 | with varix of the abdominal veins | | - - - | |
| 67798 | 15786 | — | | | 83584 |

In addition to the above statement, the following varieties in the situation of this malady have been noticed, viz. in

801 MALES.

| | | |
|-----|-----|---|
| 184 | had | Left inguinal and right femoral hernia, |
| 82 | | Left inguinal and left femoral hernia, |
| 13 | | Left inguinal and double femoral hernia, |
| 10 | | Left inguinal and ventral hernia, |
| 13 | | Left inguinal and umbilical hernia, |
| 3 | | Left inguinal hernia and prolapsus ani, |
| 3 | | Left inguinal, umbilical, and ventral hernia, |
| 135 | | Right inguinal and left femoral hernia, |
| 27 | | Right inguinal and right femoral hernia, |
| 25 | | Right inguinal and double femoral hernia, |
| 16 | | Right inguinal and ventral hernia, |
| 26 | | Right inguinal and umbilical hernia, |
| 7 | | Right inguinal hernia and prolapsus ani, |
| 1 | | Right inguinal, umbilical, and ventral hernia, |
| 87 | | Double inguinal and right femoral hernia, |
| 54 | | Double inguinal and left femoral hernia, |
| 27 | | Double inguinal and double femoral hernia, |
| 1 | | Double inguinal and double femoral hernia outside of the femoral vessels, |
| 12 | | Double inguinal and ventral hernia, |
| 1 | | Double inguinal and double ventral hernia, |
| 48 | | Double inguinal and umbilical hernia, |

constituting *vaginal* hernia: *pudendal hernia* is a modification of the affection, in which the parts, instead of protruding any portion of the vagina, pass into the labium pudendi.

The *ischiatric* rupture, and that of the *foramen ovale*, take place through the respective openings of the pelvis,

- 18 Double inguinal hernia and prolapsus ani,
- 2 Double inguinal, umbilical, and ventral hernia,
- 1 Left femoral and umbilical hernia,
- 1 Right femoral and ventral hernia,
- 1 Right femoral and umbilical hernia,
- 1 Right femoral hernia outside of the femoral vessels,

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366 FEMALES.

- 13 had Left inguinal and left femoral hernia,
- 40 Left inguinal and right femoral hernia,
- 1 Left inguinal and double femoral hernia,
- 2 Left inguinal and umbilical hernia,
- 6 Left inguinal hernia and prolapsus uteri,
- 1 Left inguinal hernia and prolapsus ani,
- 20 Right inguinal and left femoral hernia,
- 5 Right inguinal and right femoral hernia,
- 1 Right inguinal and double femoral hernia,
- 9 Right inguinal and umbilical hernia,
- 3 Right inguinal and ventral hernia,
- 3 Right inguinal hernia and prolapsus uteri,
- 1 Double inguinal and right femoral hernia,
- 8 Double inguinal and umbilical hernia,
- 5 Double inguinal and ventral hernia,
- 1 Double inguinal hernia and prolapsus uteri,
- 28 Single femoral and umbilical hernia,
- 10 Single femoral and ventral hernia,
- 1 Left femoral and double ventral hernia on the right side,
- 1 Left femoral and right obturator hernia,
- 3 Left femoral hernia on the outside of the femoral vessels,
- 14 Single femoral hernia and prolapsus uteri,
- 2 Right femoral hernia on the outside of the femoral vessels,
- 1 Right femoral hernia on inside and outside of the femoral vessels,
- 2 Right femoral hernia, prolapsus uteri, and prolapsus vesicæ,
- 12 Double femoral and umbilical hernia,
- 3 Double femoral and large ventral hernia,
- 8 Double femoral hernia and prolapsus uteri,
- 2 Double femoral hernia and prolapsus ani,
- 22 Umbilical and ventral hernia,
- 5 Umbilical hernia and prolapsus uteri,
- 1 Umbilical hernia, prolapsus uteri, and prolapsus vesicæ,
- 1 Ventral hernia and prolapsus uteri,
- 5 Prolapsus uteri and prolapsus ani,
- 109 Prolapsus uteri and prolapsus vesicæ,
- 8 Prolapsus uteri and prolapsus vaginæ,
- 10 Prolapsus uteri, prolapsus vesicæ, and prolapsus vaginæ.

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and the *hernia of the diaphragm* is protruded through some part of that muscle.

The mesentery and mesocolon are the seats of *mesenteric* and *mesocolic* herniæ; and the bowels undergo various internal strangulations, not coming properly under the description of herniæ.

The names *enterocele* and *epiplocele*, which are equivalent to *intestinal* and *omental* rupture, are employed according as the swelling contains intestine or omentum alone: where both these parts are found in the same tumour, it forms an *entero-epiplocele*.

A protrusion of the urinary bladder constitutes the *cystocele*, or *hernia vesicæ*; that of the stomach, *gastrocele*; of the spleen, *splenoccele*, &c. A compound word is sometimes employed, expressing both the situation and contents of the rupture; as *entero-bubonoccele*, *epiplomphaloccele*, &c.

The case of *double* ruptures (*inguinal* or *femoral*) is constituted by the protrusion of the viscera through the corresponding apertures of the right and left side. But there is another kind of double rupture, not ascertainable in general, except by examination after death, or in ope-

Five thousand four hundred and forty-eight patients had congenital hernia.

7299 patients were relieved with trusses under ten years of age.

| | |
|-------|-------------------|
| 4551 | between 10 and 20 |
| 8715 | 20 — 30 |
| 13614 | 30 — 40 |
| 15627 | 40 — 50 |
| 14169 | 50 — 60 |
| 9761 | 60 — 70 |
| 3866 | 70 — 80 |
| 442 | 80 — 90 |
| 23 | 90 — 100 |

78067

Of 457 herniæ examined by M. CLOQUET, 307 occurred in the male, 150 in the female sex; 246 on the right, 187 on the left side, and 24 on the middle line of the abdomen.

The numbers of the different kinds were as follows:—

| Males. | Females. | | | | |
|--------|----------|--------------------------|-----------------|-----------------|--|
| 94 | 11 | Right external inguinal | } 203 external. | } 289 inguinal. | |
| 79 | 19 | Left - - - - - | | | |
| 39 | 8 | Right internal - - - | } 86 internal. | | |
| 35 | 4 | Left - - - - - | | | |
| 33 | 54 | Right femoral - - - | } - - - - - | } 134 crural. | |
| 22 | 25 | Left - - - - - | | | |
| 3 | 21 | Umbilical and linea alba | - - - - - | 24. | |
| 2 | 5 | Right obturator - - - | } - - - - - | } 10 obturator. | |
| 0 | 3 | Left - - - - - | | | |

Recherches sur les Causes et l'Anatomie des Hernies abdominales, p. 9, note.

rating; *viz.* two sacs passing through the same opening; this may happen in external or internal inguinal, or crural herniæ. There are instances of even three sacs, particularly in inguinal herniæ.

SECTION III.—THE PERITONEUM; ITS STRUCTURE, PROPERTIES, AND CONNEXIONS.—FORMATION AND PRINCIPAL VARIETIES OF THE HERNIAL TUMOUR.—ANATOMY OF THE HERNIAL SAC, AND ITS VARIOUS CHANGES IN FIGURE, STRUCTURE, AND CONNEXIONS.—REDUCTION OF THE SAC IN VARIOUS MODES.—MORBID CHANGES IN THE SEROUS MEMBRANE COMPOSING IT.

THE peritoneum lines the cavity of the belly, and is reflected over the contained parts; the former portion constituting a large membranous bag, which immediately surrounds and incloses the viscera, while the latter gives to each its external covering. This serous membrane is thin, semi-transparent, and perfectly smooth on its internal surface, the latter being constantly lubricated by the exhalation of a serous fluid, or rather a vapoury moisture, which gives it a polished appearance. Hence, the several viscera move with perfect freedom on each other and over the surface of the cavity, in the execution of their functions, and in the changes of situation caused by the actions of the respiratory muscles.

The texture of the membrane is compact and firm, so that it is much stronger than we should have expected from observing its thinness and semi-transparency. Besides facilitating the movements of the viscera, it helps to keep them in their proper situation, and presents no inconsiderable resistance to their protrusion. At the same time, being elastic, it quickly regains its original state, when distending forces cease to act. “The peritoneum,” says SCARPA, “in spite of its delicate structure, can bear very considerable distension without giving way or losing its natural elasticity. I have made the experiment of dissecting out a large disk of the membrane from a subject recently dead, and tying it over a cylinder, so as to stretch it like the head of a drum. In this way it supported a weight of fifteen pounds without rupturing, and it nearly

recovered its former position after the weight had been removed. If the pressure were continued for a considerable time, and gradually increased, the membrane lost its elasticity, and became depressed into a kind of bag. But, setting aside such experiments, there are numerous well-known pathological facts, proving clearly that the abdominal muscles and their aponeuroses would not be sufficient to retain the viscera in their natural position without the elastic bag of the peritoneum.”*

The peritoneum is not of uniform thickness throughout. In the lower and anterior part of the cavity, and in the loins, where it sustains the greatest force, it is strong, whitish, and semi-opaque. It is very thin about the navel and along the linea alba generally, where it is supported by the aponeurotic sheaths of the recti; from the point, where these sheaths terminate, down to the pubes, it is again dense and strong.

The texture and strength of the membrane vary in different subjects. “In some,” says M. J. CLOQUET, “the peritoneum, where it lines the abdominal parietes, is thick, whitish, semi-opaque, and nearly conceals the colour of the subjacent parts. It possesses considerable strength in these cases, and cannot easily be torn: sometimes it is extensile, and gives way so as to form a pouch, when loaded with a weight; sometimes, on the contrary, it cannot be stretched without difficulty. This kind of organisation is frequently met with in the peritoneum of those who have died of ascites; it may be seen occasionally, but rarely, in other individuals. In many subjects the peritoneum is extremely thin, and so transparent, that the parts beneath can be seen distinctly through it. It is less strong than in the former case, but it may be equally capable of extension. I have found this state of the membrane in the bodies of fat persons, where the peritoneum, sometimes as thin and transparent as the arachnoid, is either torn by the slightest effort, or presents a degree of resistance, which we should not have expected. This thinning, which may be seen in other serous membranes also in very fat individuals, seems to me to arise from the exterior laminae becoming filled with fat, so that the membranes undergo a kind of partial decomposition from without inwards. The thickening, in the case of dropsy, depends probably on the external laminae of cellular tissue being

* *Sull' Ernie*, ed. 2, p. 8.

condensed by the pressure of the effused serous fluid. In those who have died of scurvy, cancer, or other cachexiæ, the peritoneum, as well as most other tissues, preserves its usual aspect, but can be torn with the greatest facility. The strength and elasticity of the membrane are not always in a direct ratio to its thickness. If we subject it to the pressure of various weights, as SCARPA has done, we find, in the first place, that its force and elasticity are much increased by the cellular tissue on its external surface. 2ndly. That different weights are necessary, in order to stretch to an equal degree portions of peritoneum taken from corresponding situations in different subjects, or from different parts in the same subject. 3rdly. That the peritoneum, having been elongated into a pouch in such experiments, sometimes resumes its former position when the weight is removed, on other occasions recovers only imperfectly. 4thly. That in these experiments, it is sometimes simply stretched or elongated, while, in other cases, its laminae give way, and are a little torn, experiencing slight cracks, more particularly observable on the external surface, which I call *éraiilemens* : in the latter case, the membrane having been stretched, thinned, and partly torn, the pouch which it forms continues for a longer or shorter time.”*

To the linea alba, and to the aponeurotic sheaths, which enclose the recti muscles, the peritoneum adheres closely, and almost inseparably : it is loosely connected to the rest of the abdominal parietes, and particularly at the lower and anterior part, the back and sides, by a soft, extensile, and elastic cellular substance, which yields readily when the membrane is subjected to the action of a distending force, and thus allows it to undergo a real change of situation or displacement without any laceration of the connecting medium. This locomotion of the membrane, without rupture of its natural connexions, is evidenced in the descent of the bladder, cœcum, and sigmoid flexure of the colon into the scrotum.

The phenomena of ascites and pregnancy, and the varying magnitude of several abdominal viscera, prove that the peritoneum is also susceptible of elongation by distension, and that it possesses an elastic power capable of restoring its former state, when the distending force ceases to act.

In cases of sudden forcible distension, particularly where the membrane is thin and adheres closely to the abdominal

* *Recherches Anat.* p. 46—48.

parietes or other surrounding parts, its texture yields partially, and undergoes a loosening, or species of laceration, such as in the case of silks or other stuffs we call fraying, the French *éraiement*. A kind of cicatrisation follows, and leaves lines or marks behind, indicating the nature of the occurrence. "These *éraiements*," says M. J. CLOQUET, "happen particularly when the peritoneum, adhering to the subjacent parts by a dense, close, cellular tissue, is dragged or displaced. Hence this partial laceration is frequent in the situation of the linea alba, from the distension of the abdomen and the separation of the recti muscles; and I possess several remarkable specimens of this kind. In the part, which has been thus frayed, the peritoneum is preternaturally thin, representing a network of slender fibres, leaving irregular interspaces, which are filled by an extremely fine transparent pellicle. This kind of change is observed, not only in the peritoneum lining the abdominal parietes, and that which forms the hernial sac, where it is very common, but also in the serous covering of the displaced viscera, in the mesentery and intestine, when they have been dragged and elongated in large ruptures." *

The locomotion or displacement, the extension or elongation, and the partial rupture or fraying of the peritoneum, account satisfactorily for the origin and increase of the hernial sac; and the two changes first mentioned explain sufficiently the great size which the bag sometimes attains. Scrotal ruptures may hang halfway down the thigh, and sometimes nearly reach the knee; yet the whole inner surface of the swelling, in which all the loose viscera of the abdomen may be contained, is lined by a continuation of the peritoneum, without any laceration or interruption.

By pressure with the finger in the dead body, we can force the peritoneum through the tendinous openings in the abdominal parietes, and thus form an artificial hernial sac. In repeating such trials we gain evidence of a fact already noticed; namely, that the strength and resistance of the membrane vary considerably in different subjects. Where it is thick, and closely adherent, great force is necessary to push it through the opening, and it experiences partial laceration: in other cases it is thin and weak, and may be torn by slight pressure: in some subjects, it pos-

* *Recherches Anat.* p. 48.

sesses considerable elasticity, and yields to the finger so as to form a sac.

These experiments have been diversified by M. J. CLOQUET, who has described their various results, observing that there is only a partial analogy between what thus takes place in the dead body and the formation of ruptures in the living subject. "In some individuals the natural openings of the abdominal parietes are large and loose; if we push the finger through, the peritoneum is carried before it, forming a production, which represents a hernial sac. Here the cellular tissue is not torn, but elongated. When the pressure is discontinued, the membrane gradually regains its original position. This experiment shows that the peritoneum is actually displaced in the formation of a hernial sac; that it leaves the neighbouring parts to pass into the aponeurotic opening. The abdominal parietes lend the peritoneum which covers them to form the hernial sac. The membrane is hardly stretched, and it forms folds in the opening: in some instances it is both displaced and elongated, covering the finger closely. In other subjects the peritoneum resists more forcibly, because it adheres more closely to the parietes: the portion, however, near to the tendinous opening becomes stretched; its laminæ separate and are partially torn, and we thus form a very thin sac, different from that in the former instance, which has the natural thickness of the peritoneum. The displaced membrane in this case does not recover its former position, and we find partial lacerations in the fundus of the sac. We thus see that the peritoneum forms the hernial sac either by undergoing displacement, or by stretching and partial rupture of its laminæ. In the former case, the sac has the thickness of the membrane, which is not altered in texture, and easily returns to its natural state, while in the latter it is thinned, partially torn, and regains its original situation incompletely." *

The pressure of the abdominal viscera in the living body, under the circumstances explained in the following chapter, causes true ruptures by a process analogous to that which occurs when artificial ones are formed in the dead subject by means of the finger. The contained parts are urged against the peritoneum lining the abdomen, and force it through openings, whether normal or accidental, in the parietes.

* *Recherches sur les Causes et l'Anat. des Hernies Abdom.* p. 16—18.

In some rare instances, the origin or increase of a hernial sac, or the descent of the viscera, may be owing to a dragging of the membrane from without. M. JULES CLOQUET has pointed out various circumstances under which this may take place.

“ When we draw the testicle downwards, the cord is elongated, and the depression of the peritoneum at the upper orifice of the inguinal canal is deepened: if there should be an external inguinal hernia, the sac is stretched and lengthened. The weight of an enlarged testicle, or of a voluminous hydrocele, if unsupported, has the same effect, as I have seen in many instances. In the body of an old man there was an external inguinal hernia. The sac was five inches long; its orifice was large and rounded, and its cavity was divided into two parts by a fibrous prominent ring. Below the latter, the peritoneum was thick, whitish, and strongly adherent to the external coverings; above, it was thin and transparent, as in the abdomen. The descent of the thickened ring, and the elongation of the sac, had been obviously caused by the weight of a large hydrocele of the tunica vaginalis, which adhered firmly to the lower part of the hernial tumour. A convolution of the small intestine, two inches and a half long, and unadherent, occupied the upper division of the sac.

“ The gubernaculum testis, in the fœtus, contracting and becoming shortened, carries with it the testicle, the portion of the peritoneum which is to form the tunica vaginalis, and the lower fibres of the obliquus internus which constitute the cremaster. If the intestine or omentum should adhere to the testicle in the abdomen, it will be a question whether this organ shall be retained in its original situation by the adhesion, or shall be drawn into the scrotum by the gubernaculum. In the latter case, the adherent viscera are carried, with the testicle, into the prolongation of the serous membrane, which is to form the tunica vaginalis, and thus give rise to a congenital hernia.

“ On the contrary, if the testicle should be retained in the abdomen or in the inguinal canal, the gubernaculum sometimes contracts towards the scrotum, and carries down the production of peritoneum, which should form the tunica vaginalis, and the epididymis, which it partially unravels and separates from the testicle. Thus a sac is formed ready to receive a protrusion of the abdominal viscera.

“Masses of fat may be formed on the surface of the peritoneum, and are connected to the membrane by a vascular pedicle, containing their nutrient vessels. These adipous productions may pass through natural or accidental openings in the abdominal parietes, may increase considerably, and draw out the peritoneum so as to form a sac, into which the viscera may be protruded. In the body of a very fat old man, I found a rounded tumour, as large as an egg, in the bend of the thigh: it appeared like an irreducible crural epiplocele. It was covered by the fascia superficialis and three absorbent glands, and immediately invested by a very thin cellular tunic. It consisted of fat disposed in elongated pyriform lobules: these were united above into a slender rounded fasciculus, which passed under the crural arch, and was then attached to the surface of the peritoneum. The membrane had been drawn out by this pedicle through the crural canal, and formed an empty conical cavity large enough to receive the end of the finger. The pedicle and the peritoneal production had the same relations to the surrounding parts, as the sac of a crural hernia. The parts are represented in Pl. ix. fig. 1. Several fatty tumours of similar kind were found on other parts of the peritoneum, and passed through openings in the aponeurotic parietes of the abdomen. In another instance, a soft doughy tumour, situated on the cord, with the external characters of an irreducible epiplocele, was found to consist of fatty lobules united into a pedicle, which passed through the ring with the spermatic vessels, and was connected to the peritoneum, of which a small conical production was drawn into the inguinal canal.

“The protrusion is increased by a dragging from without in certain herniæ containing the bladder or the cœcum; and it is thus that the organs of a more fixed kind, such as the uterus, fallopian tubes, and ovaries, are drawn towards or into the hernial sacs.”*

The hernial sac, generally small when first produced, may continue permanently of its original size, or with a slight increase of magnitude. More commonly, it enlarges gradually from the same causes which first produced it, or from others of an analogous nature. Thus it is sometimes a small cavity, not larger than the end of the finger, while in other instances, it constitutes a large bag, holding a

* *Recherches sur les causes et l'Anatomie, &c.*, p. 21—26.

considerable portion of the abdominal viscera ; and it may be of any intermediate size.

The following are the circumstances which contribute principally to the enlargement of the tumour. Firstly ; strong and frequent pressure of the protruded parts against the hernial sac ; hence the great size which ruptures often attain in persons who pursue laborious occupations. Secondly, looseness of structure in the regions which the swelling occupies : thus scrotal ruptures are usually large, crural small. Thirdly, large size and weakness of the opening through which the protrusion takes place ; hence inguinal herniæ generally much exceed crural ruptures in size. Fourthly, looseness in the cellular connexions of the peritoneum ; hence inguinal herniæ often attain a considerable magnitude, while ruptures of the linea alba are generally small. Fifthly, depending position : thus the largest ruptures are those which take place through the abdominal ring.

CHANGES IN THE HERNIAL SAC.

When the peritoneum is protruded through an opening in the abdominal parietes, it simply passes over the surface of the part : the tendinous ring, being firm and resisting, supports the mouth of the sac, and determines its form and size. The direction and magnitude of the neck depend on the nature of the parts through which it passes : as the latter are generally unyielding, the mouth and neck are, for the most part, comparatively small ; while the body of the sac, opposed merely by the cellular and adipous substance exterior to the parietes, expands, and is generally much larger.

As the course of the openings is in some instances more or less indirect, and the subsequent developement of the tumour depends on the degree of resistance that it may meet with, the direction or axis of the sac varies in different parts of its course. A knowledge of these variations is of importance in reference to reduction, and to the application of trusses.

The form of the sac must necessarily be modified by that of the opening through which it is protruded, by that of the parts into which it passes, and by the resistance which it experiences in different parts of its progress and surface : these causes will also influence the size which the tumour may acquire. Hence the difference, in figure and magnitude, between scrotal, femoral, and umbilical ruptures.

If the sac passes into an aponeurotic canal, and follows its direction, it has an elongated and somewhat cylindrical figure. Such is the case in incipient external inguinal herniæ, and even in those which have passed the ring, and are still confined by the sheath of the spermatic cord. When the cylindrical sac has quitted the tendinous canal, it experiences less resistance, and enlarges into a rounded swelling; it then consists of a smaller cylindrical portion, terminated by a globular enlargement; or, it may increase gradually, as it descends, and assume a pyriform shape.

When the sac, having passed through a simple opening in the abdominal parietes, is situated among loose cellular or adipous tissue, of which the resistance is equal in all directions, it expands equally, and forms a nearly spherical tumour, which is generally rather flattened from the resistance of the integuments: umbilical and some crural ruptures are of this kind.

If the sac should be situated under an aponeurosis, as in the imperfect external inguinal hernia, it will be quite flattened, and have an indistinct outline, when examined externally.

Sometimes, but not frequently, the sac is conical, the mouth forming the basis, and the fundus, which is usually obtuse, the apex of the cone. Such sacs have no neck.

It will appear, from the foregoing observations, that the figure of the sac must often vary, at different periods of its progress, in the same case; cylindrical or conical at first, it will become globular or pyriform subsequently.

Although the sac generally presents, either one of the configurations which M. J. CLOQUET calls *primitive types*, namely, the cylindroid, the spheroidal, the conical, or the pyriform, or a combination of any two, which he calls *secondary varieties*, it is often irregular in shape. The membrane extends in some points more than in others, from difference in the degree of resistance, or from inequality in the pressure of the protruded parts.

While the tendinous openings influence the form, direction, and extent of the sac, hernial tumours, on the other hand, produce no less important changes in the parts through which they are protruded, distending and enlarging the aponeurotic apertures, altering their length, direction, and figure, separating and expanding the tendinous fibres.

Thus ruptures and the surrounding parts act mutually on each other. The tumour, in the first instance, accom-

modates itself to the organs, among which it is placed ; it then becomes adherent to them more or less strongly, presses upon and distends them, altering their position, and sometimes separating their component parts, as in the spermatic cord, which is in a manner taken into the sac, so as to form a part of the swelling.

At the first moment of its occurrence, when the hernia is formed suddenly, the protruded peritoneum must be unconnected to the parts, among which it lies : but adhesions take place so quickly, that the sac is found universally connected to the contiguous parts, even in a rupture of two or three days' standing ; and these connexions become afterwards so strong and general, that we might suppose the hernial sac to have been originally formed in its unnatural situation. In the subsequent increase of such ruptures, the peritoneum is slowly displaced, without separation of its cellular connexions ; while, in other cases, the sac is slowly developed in the same manner, from the first, so as never to be found unadherent.

The sac adheres to the surrounding parts by a cellular texture, of which the fibres are short, but soft and pliant. Sometimes the adhesion is more loose, the adipous and lax tissue, which covers the peritoneum in the inguinal and crural regions, being copious, and descending with the membrane. In other cases, the adhesion is rendered firm and compact by the consequences of inflammation, from pressure and other causes : in this way, the hernial sac may become consolidated with the skin or other surrounding parts.

The adhesions of the sac prevent it from being returned into the abdomen, when the contents of the swelling are replaced ; it remains behind, ready to receive any future protrusion. The difficulty, arising from the same source, in separating the sac from the surrounding parts, particularly from the spermatic cord, constitutes an insuperable objection to the proposals for returning it into the abdomen ; and must have been a source of great danger in some of the old methods of attempting the radical cure of ruptures.

The peritoneum, which immediately surrounds the protruded viscera, retains generally the same thin and delicate structure, which characterises the membrane in its natural situation. It has the same polished and secreting surface, from which a serous exhalation proceeds ; it envelops and protects the protruded organs, embracing them

closely, and being to them what the great bag of the peritoneum is to the contents of the abdomen. There is, however, this difference in the two cases, that the peritoneal covering of the hernia may undergo change of structure from blows, pressure, and the other sources of external irritation to which the swelling is necessarily exposed.

The hernial sac, when thus formed, may remain stationary, in respect to size, form, and position; it may become enlarged, generally or partially; it may be diminished, and even entirely disappear, the peritoneum returning to its original situation.

Although the peritoneal covering of a rupture in most cases undergoes but little change, it sometimes exhibits alterations more or less conspicuous. Usually it is somewhat thickened, and at the same time rendered firmer at the orifice of the sac. It may be a little thickened and opaque generally. Its thickness may be increased by effusion of lymph on the serous surface and its subsequent organisation. Lastly, adventitious deposits of cartilaginous or osseous nature have been seen in old ruptures; on the other hand, the peritoneum of the sac is sometimes preternaturally thin, especially when the hernia is formed by distension of the membrane, as in those of the linea alba in the adult.

This peritoneal sac is covered by other investments, varying in thickness and structure, according to the part in which the swelling is formed, and to other circumstances. The thickness of the hernial sac, taken altogether, depends on these adventitious coverings, the changes in the state of the peritoneum being comparatively inconsiderable: it is generally thicker and stronger, in proportion to the size of the tumour, and the duration of the complaint; thus the sac has been seen of six lines in thickness.* Yet, occasionally, instead of increased thickness, we observe the opposite process of absorption, or thinning, in large ruptures: in some cases the coverings are so reduced, that the convolutions and vermicular motions of the intestines may be distinguished through the skin; hence it might be suspected that the sac is entirely wanting; but it will be possible to trace the peritoneum clearly in the neighbourhood of the opening; while it may be found in a very thin state, or consolidated with the integuments in other situations.

* ARNAUD, *Mémoires de chirurgie*; tom. i. p. 53.

The mouth of the sac is generally rounded ; sometimes it is oblong, or triangular with the angles rounded off ; or it may be in the form of a narrow slit. It varies in size, from that of a quill, or even of a probe, to a magnitude capable of admitting the fist, and allowing the entrance of all the abdominal viscera. Sometimes it projects a little towards the cavity, in consequence of fat being deposited between the peritoneum and the tendinous opening.

Most commonly it is directed towards the centre of the abdomen ; such, at least, is the case in umbilical, crural, internal inguinal, and large old external inguinal herniæ. Sometimes it is oblique, presenting at the lower part a semilunar fold, of valvular form and arrangement, over which the finger must be carried, in a slanting direction, to enter the sac. Recently formed external inguinal herniæ present examples. This obliquity must, to a certain extent, impede the origin and increase of such ruptures, as the viscera cannot be protruded directly.

The peritoneum is generally applied closely to the tendinous opening, adhering to it by cellular substance, so that the mouth of the sac, and the aperture at which it protrudes, are of the same size. These parts may, however, be separated, as in protrusions of the bladder, cœcum, and sigmoid flexure ; where the mouth of the sac may be small, while the ring is large. In such cases the peritoneal covering of the protruded viscus forms part of the mouth of the sac, and is separated from the tendon by the organ which it covers. Fat is sometimes collected about the mouth of the sac, separating it from the aponeurotic opening.

The connexion of the sac to the tendinous aperture varies much. Sometimes it is so firm as not to be separable without difficulty, and even laceration. It may be so loose that the separation is quite easy ; and thus the neck of the sac may pass readily towards the abdomen, or in the opposite direction.

The mouth and neck of the hernial sac often undergo considerable change, which constitutes an important subject in the pathology of ruptures. This and the anatomy of the sac generally, have been most diligently investigated, and described, and explained with great ability, by M. JULES CLOQUET, in his *Recherches sur les Causes et l'Anatomie des Hernies Abdominales*, 4to. Paris, 1819 ;

illustrated with ten plates, containing numerous lithographic figures from his own drawings.

“The thickness of the neck of the sac,” says M. C., “varies much. In small ones, of a conical figure, the peritoneum retains its natural structure at this part, simply turning over, and lining the aponeurotic ring. This is the least frequent case; more commonly, in passing through the narrow aperture, it is folded, puckered, contracted, and gains in thickness what it loses in extent of surface. The whole circumference of the neck presents fine folds, radiated wrinkles, more or less numerous, and approximated to each other. If we distend these folds, they are seldom completely effaced, as the two membranous plates, which form each of them, become adherent; this puckering, or gathering, of the peritoneum, necessarily increases the thickness of the neck of the sac.

“These folds are the rudiments of those, which form when the mouth of the sac gradually contracts; it ultimately disappears, giving origin to radiated marks, disposed like the rays of a star, and indicating the place of its former existence. I have called these marks *stigmata* of the hernial sac, because they closely resemble true cicatrices of the peritoneum and other serous membranes. Sometimes the neck of the sac presents a rounded, whitish, almost fibrous, and very firm ring, either of uniform or varying thickness, in different points of its circumference. In other individuals it is thin, presenting an incomplete septum, with central aperture, formed by the mutual contact of the hernial sac, and the peritoneal lining of the abdomen. The opening is generally furnished with a thick fibrous edge, or it may be thin and cutting.” *

In many herniæ, the orifice of the sac presents a combination of the preceding characters. Thus it may be fibrous, thick, and rounded, in one part; thin, and like a valvular fold, in another; hard, callous, and folded, in one place; uniform and natural in other parts.

These important changes in the membrane forming the mouth of the sac are easily accounted for by the circumstances attendant on its new situation, where it is confined in the aponeurotic opening, pressed between it and the protruded parts, and generally subject to the nearly constant pressure and irritation of a truss. The peritoneum, which, in its natural state is soft, thin, and yielding, becomes thick

and hard, and the mouth of the sac is converted into a kind of callous ring. The effect is augmented by the surrounding cellular substance undergoing a similar change. In this way the part acquires a considerable thickness, with a kind of cartilaginous hardness; and thus becomes capable of embracing very firmly the protruded parts.*

The hernial sac will increase in size under the continued action of the same causes which have originally produced the complaint; that is, the pressure of the viscera impelled by the action of the respiratory muscles, the weight of the contained parts, and the dragging on the swelling occasioned by external causes. "If," says M. CLOQUET, "the mouth and neck of the sac adhere closely to the aponeurotic opening, so as to prevent farther descent of the peritoneum, that portion of the membrane which forms the sac is distended, thinned, and even partially ruptured. Thus the sac is enlarged, and its parietes exhibit numerous frayings (*érailemens*,) whitish, fibrous, reticulated filaments, united by a delicate transparent pellicle. Sometimes the peritoneum does not give way uniformly; the sac is thinner in some places than in others, and the swelling exhibits irregular protuberances. This happens particularly in umbilical herniæ, and in some inguinal and crural ruptures. In these cases the neck of the sac remains closely connected to the aponeurotic opening. Thus most of the protuberances, and certain secondary cavities of the hernial sac, owe their origin to distension and fraying of its weakest parts. At the edge of a portion, which has thus yielded, the peritoneum sometimes becomes thickened, and forms a circular ring, which constitutes a boundary between the general cavity of the sac and these secondary cells. On the contrary, in the greater number of cases, the neck does not adhere so closely, and the thickened ring which it forms separates from the opening under the continued pressure of the viscera, and descends; a fresh ring will form at the new mouth of the sac.

"When the hernia passes through a canal, the openings

* ARNAUD found the neck of the sac "entièrement cartilagineux, épais de trois lignes."—*Tr. des Hernies*, tom. ii. p. 11.

SCARPA has very frequently found the neck of the sac thus changed: sometimes contracted for the length of an inch, at others, simply constricted at one point, or thickened, with the cellular substance and the cremaster hardened, and the whole coriaceous and unyielding.—*Tr. sur les Hernies*, m. ii. sect. vii.

of which are narrower than the middle, the sac may become contracted at each orifice, and thus present two thickened rings. I have found this in external inguinal and in some crural herniæ.

“ A constriction more or less sensible externally generally denotes the situation of those thickened rings which have descended with the sac. They vary in number, position, and structure, and produce the septa and valvular folds met with in hernial sacs.

“ The several divisions of a sac having many rings may be considered as distinct protrusions, descending successively at different periods.

“ These rings present many varieties of position in relation to the axis of the sac: the opening, which they circumscribe, may be perpendicular, oblique, or even parallel to the axis. These varieties depend on the original direction of the ring in the aponeurotic opening, and on the mode in which it descended during the enlargement of the swelling. If the latter increases equally in all directions, the ring retains its original relations, and remains nearly perpendicular to the axis of the tumour. But if the sac adheres more closely in one direction than in another, it descends unequally, and becomes more or less oblique in position.

“ These thickened parts are fibrous whitish prominences, either constituting complete rings, or confined to a part of the sac. They sometimes form partitions or diaphragms, with a central perforation, by which the two divisions of the sac communicate. Like other folds of peritoneum, they are formed by two laminæ of the membrane, sometimes adhering closely, in other instances readily separable by cutting the cellular membrane which unites them. The opening in these partitions is generally rounded, the margin sometimes being thick, fibrous, and strong. Sometimes the aperture is so small that the parts contained in the upper division of the sac cannot pass into the lower. Occasionally, these partitions are found on one aspect only of the sac: they then form a kind of semi-lunar valvular folds.

“ The thickened neck, when pushed beyond the aponeurotic opening, must experience distension and compression from the organs contained in the rupture, or from surrounding parts. Thus its two component laminæ may be separated, and assist in the enlargement of the sac, the

contraction being effaced entirely or in part. A trace of it remains in the shape of a white fibrous line slightly prominent.

“ This decomposition of the thickened ring is far from being a constant occurrence. Sometimes the contraction increases ; it embraces closely the protruded parts ; it may become adherent to them, or may even be the cause of strangulation. If no part is contained in the aperture, the constriction may go on so as to obliterate it entirely, and form a complete septum. In such a case the inferior portion of the sac would form a closed cyst intimately connected to the surface of the hernial tumour.

“ The appendices and serous cysts occasionally found in connexion with hernial tumours owe their origin, in most instances, to old contracted or closed sacs, pushed forwards or to one side by new protrusions.” *

We sometimes meet with sacs composed of two lateral cavities, or consisting of two or more secondary openings into one principal protrusion ; or the original serous cavity may be contracted, and form a small appendix to the subsequent protrusion. The mode in which these varieties are produced has been well explained by M. J. CLOQUET, who has given detailed descriptions and figures of them in his work, already quoted. He observes, that the hernial sac, when contracted at its neck, and pushed outwards by a new protrusion, does not always descend below the latter. If it adheres closely to the aponeurotic opening at one point of its circumference, the thickened ring may be displaced partially or unequally. The lower portion descends, and is either elongated or decomposed, or merely turned aside by the new protrusion ; hence arise two sacs united by their necks at the ring, and lying close together. The two sacs may afterwards descend below the ring, and have only a common opening into the abdomen. Several sacs may form at the same ring, and descend successively, so as to form a sac composed of secondary cavities, with a common opening into the belly.

When the neck of the sac first formed has become completely obliterated, a new protrusion may pass out at its side, and carry the old one down with it. The latter then forms a cyst with smooth surface, moistened by serous exhalation, adhering closely to the new sac. Close examination will generally discover, on the surface of the sac, the

* Page 46—54.

stigmata which indicate the neck of the original protrusion. It is in this way that two, or even three, sacs may pass through the same ring by the side of each other, either communicating together or otherwise.

Most of the serous cysts found not unfrequently round hernial tumours, and sometimes causing doubt or embarrassment in the operation, are ancient sacs obliterated at the neck and adhering to the swelling. There is no doubt that cysts may also be developed in the cellular texture exterior to the peritoneum. In external inguinal hernia, too, serous cysts may be found which are the remains of the peritoneal elongation originally constituting the tunica vaginalis.

M. CLOQUET adds, that these serous cysts, or false sacs, are much more frequent in external inguinal herniæ than in other ruptures: then come the internal inguinal and the crural. He had only seen one example in an ex-omphalos.*

A curious modification of form in the hernial sac has been described and figured by M. CLOQUET, under the denomination of "*Sac à appendice renversé*:" he has also explained clearly the mechanism of its production. "I have observed this kind of sac only three times, in external inguinal herniæ of males. They presented the following arrangement. At the bottom of the sac, and on its posterior surface, there was a round opening with a fibrous neck, leading into an empty conical, elongated, serous cavity, which ascended vertically at the back of the sac, between it and the cord. The fundus or point of this appendix, which was its highest part, was firmly connected to the front of the cord; and the cyst itself adhered closely to the back of the sac. It was obviously an old hernial sac; but how had it become thus inverted? The following, I conceive, is the explanation. A hernial sac is kept empty by the use of a truss; its neck becomes fibrous and contracted, but is loosely connected to the ring, while the fundus has formed a close adhesion to some portion of the spermatic cord. If the use of the truss is now abandoned, the pressure of the viscera pushes the contracted neck through the ring, and carries it downwards. At a certain point of the descent, the old sac is turned upside down, the neck passing below the fundus, which is retained by the adhesion in its original situation. Thus the peculiar

* Page 61—70.

position of such an appendix depends not on an ascent of its lower, but on a descent of its upper, portion." *

If the hernial sac is kept empty, so that it is no longer exposed to the causes which have led to its production and increase, it may pass back again into the abdomen, and resume its original position. This reduction of the sac may occur spontaneously ; it may be accomplished or assisted by the means which we employ in the treatment of ruptures.

The spontaneous reduction has been well explained by M. CLOQUET, whose extensive opportunities have enabled him to observe various modes in which the change takes place. He gives the following account of the subject :—
 “ During the formation and growth of a rupture, the peritoneum passes, and seems in a manner to converge, towards the opening by which the parts escape. When elongated so as to form a hernial sac, it still possesses its natural elasticity and contractility, which coming into action when the distending force ceases to operate, sometimes produce slowly and insensibly this spontaneous reduction of the sac. The membrane, in such cases, takes a retrograde course : the portion lining the abdominal parietes in the neighbourhood of the ring draws in all directions on the neck of the sac, which is thus distended, expanded, and at last effaced ; the sac is in a manner unfolded, and again covers the parts in the neighbourhood of the aponeurotic ring. The neck, which is the part last formed, disappears first, while the restoration of the fundus is the last step in the process, and is accomplished with difficulty : this kind of reduction, therefore, is often incomplete.

“ If the neck of the sac is a fibrous ring, this becomes enlarged, expanded, and disappears wholly or in part.† Previously to reduction, it was applied closely to the aponeurotic ring, and of course possessed the same dimensions, but now it is much larger, and does not correspond to that part. The portion of membrane circumscribed by the larger circle which it now forms, was the hernial sac. In the centre of this circle I have found, in two instances, a

* Page 71—73, pl. iii. figs. 4 and 5. The notes to this passage contain a detailed description of two cases in which this unusual arrangement of parts had occurred.

† The appearances attendant on a partial reduction of the sac are well exhibited in pl. viii. fig. 9. The dissection of this and of another analogous case is described by M. CLOQUET. *Obs.* 58 and 59, p. 74 and 75.

depression of the peritoneum formed by the fundus of the sac still engaged in the aponeurotic opening. In these cases the spontaneous reduction has been incomplete: by drawing downwards the portion of membrane still in the ring, the enlarged neck was gradually brought back to the aponeurotic aperture, and resumed its former dimensions.

“When a hernial sac has undergone this kind of reduction, the remains of the fibrous neck are sometimes seen, at a distance from the ring, in the form of irregular, whitish, more or less opaque stigmata. The peritoneum, which formed the sac, is now restored to the abdominal parietes, is rather looser in this situation, and can be easily pushed with the finger through the aponeurotic opening, so as to re-produce the sac. Sometimes the sac is so completely effaced, that the peritoneum lining the ring shows no traces of its existence. The only proof that there has been a hernia is a whitish cellular empty cavity arising from the aponeurotic ring; this cavity formerly lodged the peritoneal sac, and is ready to receive it, if it should be formed again. I have made several observations of this kind.*

“This mode of reduction must be tolerably frequent in recent herniæ, when the peritoneum constituting the sac has not had time to assume a texture in conformity with its new position. It will be favoured by the pressure of a truss on the ring, or by the patient remaining constantly in a recumbent position. This reduction of the sac will be much more difficult, and often impossible, in old ruptures. The elasticity and contractility of the peritoneum lining the abdominal parietes are counterbalanced and surmounted by the resistance of the fibrous neck of the sac, by the disposition frequently observed in that neck to contract, by its adhesion to the aponeurotic opening, and the firm connexion of the sac to the neighbouring parts. The weight and pressure of the viscera, when they continue protruded, act together with the causes just enumerated in opposition to the contractility of the peritoneum, and consequently to this mode of reduction.

“After operations for strangulated hernia, the sac is often gradually withdrawn into the abdomen, where it is probably effaced, and again applied to the surfaces it had quitted.

“The slow and insensible contraction of the cellular texture exterior to the peritoneal covering is another mode

* Two instances are detailed in the notes, *Obs.* 60 and 61. The former was an internal inguinal, the latter a crural, hernia. Page 76 and 77.

by which its spontaneous reduction may be effected. Perhaps the other coverings may assist in the process; but their action is not so obvious.

“ If the sac has not a thickened neck, and if it adheres loosely to the ring, the surrounding cellular tissue, contracting, may flatten and pucker the peritoneal process, push it into the abdomen, and prevent it from descending again through the aponeurotic opening. The peritoneum in the neighbourhood of the ring presents prominent folds, similar to those formed by the mucous membrane of the empty stomach. These folds are maintained by the thickened and closely-adhering cellular texture; if we divide that, and stretch the membrane, they disappear.

“ If the hernial sac has a firm fibrous neck, the cellular membrane contracted around it brings it into the appearance of a thick bag, uniform on its exterior, folded internally, and situated either without or within the aponeurotic opening. The folds of such a sac cannot be effaced without cutting the surrounding cellular texture, or inverting the sac, and flattening it with the fingers. I have observed this mode of reduction only in internal inguinal and crural herniæ.

“ The displacement, which the peritoneum of the abdominal parietes experiences under various circumstances, leads to a third mode of reduction. I have seen this occurrence in two internal inguinal herniæ, where the peritoneum had been drawn upwards by the enlargement of the bladder, distended from retention of urine so as nearly to reach the navel. I have several times met with small hernial sacs, in the shape of conical cavities, connected to the sides of the bladder. They had evidently belonged to internal inguinal or crural herniæ, as I have ascertained by carefully examining the state of the corresponding openings. I found a small sac of an internal inguinal hernia reduced, and situated behind the superior orifice of the crural canal. The fascia transversalis presented, near the outer margin of the rectus abdominis, a rounded opening, from which an empty cellular pouch was continued; this had contained the peritoneal sac before its reduction.* Enlargement of the uterus by pregnancy, or under other circumstances, may cause reduction of a hernial sac by

* The case is described in a note, Obs. 63, p. 80; and the parts are represented in pl. ix. fig. 3.

producing displacement of the peritoneum.* The dragging of adherent intestine or omentum may return a hernial sac; and a similar effect may be brought about by the accumulation of fat between the peritoneum and the abdominal parietes.

“ A hernial sac may be reduced by the formation of another rupture in its immediate neighbourhood. This may occur in cases of double or triple ruptures on the same side, when the sac first formed is not intimately connected to the aponeurotic opening. Under such circumstances, the newly-formed sac, increasing in size, draws towards itself the peritoneum of the previous rupture.†

“ In the two latter modes of reduction, the hernial sac generally passes into the abdomen entire, and is found between the peritoneum and the parietes. This circumstance is explained by the thickness and firmness of the neck; if that part is less strong, it may be decomposed.

“ A fourth mode of reduction is by the action of the cremaster muscle, the inverted arches of which, covering and supporting on all sides the testicle and the hernial sac, will draw these parts up towards the ring.”‡

The partial or complete reduction of the sac by the taxis will be considered in CHAPTER V., SECTION I.; and the changes which it may experience from the application of trusses, in the third section of the same chapter.

CHANGES OF STRUCTURE IN THE SAC.

The hernial sac is subject to the diseases and changes of structure, which are incidental to other serous membranes; and these generally affect, at the same time, the serous covering of the protruded viscera. Closely embraced, at its origin, by a narrow opening, forming an external tumour, and covered by little more than the skin, it is liable to direct injury by wounds, bruises, friction, pressure, or other violence, and it is exposed to the influence of heat and cold; it is subject, also, together with its contents, to the same internal causes of disease as those which

* Two cases in illustration of this point are detailed in the notes. Obs. 64 and 65, p. 80 and 81.

† Obs. 66, p. 82, pl. vii. figs. 4 and 5.

‡ *Recherches sur les Causes, &c.*, p. 74—84.

affect the abdominal cavity and its viscera. Hence it frequently becomes inflamed, and exhibits the usual results of increased action in its various degrees. The most active inflammation of the sac is observed in strangulated ruptures, where it proceeds occasionally to mortification.

The edges of the sac will unite completely, if they are brought together after a simple incised wound, such as that of the operation for strangulated hernia, and leave a linear cicatrix.

The capillary vessels of the membrane become injected in inflammation, so as to give it a preternatural redness either general or partial.

The serous exhalation, which moistens the smooth surface of the sac in its natural state, is increased in quantity and altered in its characters, where the membrane is inflamed. A fluid, like that of ascites, may be poured out under inflammation; or may be slowly accumulated from the long continuance of irritation, slighter in degree, and unattended by characteristic symptoms.

SCARPA relates the case of a young man, twenty-five years of age, who had been affected with scrotal hernia for eight years. The tumour had been about the size of a hen's egg: it enlarged suddenly from an unusual exertion in riding, under which the truss broke, and symptoms of strangulation came on. The swelling was now sixteen inches in circumference, and of uniform surface, as if it had been a vast hydrocele. On opening the sac, about three pints of a yellowish serum came out with great force. It was a common scrotal hernia. At the upper part of the sac there was a portion of intestine two inches long; ecchymoses here and there; and a very small bit of omentum. The patient recovered.*

SCHMUCKER† had seen a quart of water in a rupture. Mr. POTT‡ had often found so large a collection in old omental herniæ, that it had been necessary to puncture them for its discharge. MONRO§ removed six pints from an old scrotal rupture, to the great relief of his patient.

In an inflamed hernial sac the fluid, varying in quantity, is usually discoloured more or less considerably, and some-

* *Sull' Ernie*, ed. 2. Mem. 2, § 44. English Translation, p. 198.

† *Vermischte chirurg. Schriften*; vol. ii. p. 55.

‡ *Works*; vol. ii. p. 39.

§ *Edinburgh Essays*; vol. ii. p. 259.

times turbid. It is frequently reddish from an admixture of blood, the quantity of the latter being sometimes so considerable, as to give the fluid the dark redness and opacity of pure blood. I have seen this, together with a general dark bloody discolouration of the sac and intestine from ecchymosis, in small ruptures, where forcible attempts at reduction by the taxis had been continued for some time.

In acute inflammation of the sac we may have sero-purulent effusion containing flakes of lymph, or the secretion of a fluid not distinguishable in its sensible characters from pus. The latter occurrence has been observed as an effect of active inflammation supervening on the operation for strangulated hernia. Where the inflammation is so active, as to furnish the products just mentioned, the membrane is thickened and bright red on its serous surface, with villous irregularity, while the exterior cellular membrane is infiltrated with serum.

The fluid effused into the abdomen in ascites may pass into and distend a hernial sac; the latter either being empty, or containing protruded viscera. The sense of fluctuation, the easy passage of the dropsical fluid into the belly on pressure, and its immediate escape when the pressure is removed, together with the state of the abdomen, will render the nature of the case obvious.

If the sac should have been obstructed at its orifice, so as no longer to communicate with the abdomen, it may become distended with serous secretion, and thus form a simple membranous cyst, occupying, in the case of inguinal hernia, the spermatic cord, or the labium pudendi. In the former instance it would probably be considered and denominated encysted hydrocele of the cord. If the swelling were punctured, the character of the contained fluid would enable us to distinguish between a peritoneal cyst, and the true encysted hydrocele of the cord. In all the instances of the latter which I have seen, the fluid has been colourless and transparent, like pure water; while in the former it is like the ordinary fluid of ascites.

The serous surface of the sac and of the protruded parts, when actively inflamed, pours out coagulating lymph, which first agglutinates those parts to each other and to the sac, and afterwards, being organised, forms various adventitious productions. This effusion generally takes place both on the surface of the sac and that of the contained vis-

cera; it is sometimes confined to the former, and occasionally, though rarely, to the latter.

The effused lymph, at first pulpy, soft, and easily torn, is speedily organised, and acquires a firmer texture. It forms a connecting medium by which the viscera adhere closely to each other or to the sac; or it unites these parts more loosely by threads, or bands of various size, length, and direction, which in their firm texture and polished surface ultimately resemble the serous membrane, from which they are produced.

Effusion of fluid is sometimes combined with that of lymph; the latter may form irregular cells filled with the former; and the two are sometimes combined in a kind of spongy mass.

In the rare case of lymph being effused on the contained parts only, these may be found adherent to each other and not connected to the sac; they may even be united into a mass covered externally by an adventitious membrane.

When the exudation of lymph is confined to the surface of the sac, it forms an adventitious layer, lining the cavity partially or generally. Serous fluid may be effused between such a production and the sac.* The effused lymph may form septa, threads, or bands in the sac: when occurring in an empty rupture it might cause general adhesion of the parietes, and obliteration of the cavity. M. CLOQUET met with an instance, in which an adventitious membrane had become separated from the hernial sac, and was found collapsed and folded in the bottom of the cavity; when removed and inflated, it represented exactly the form and size of the cavity on which it had been moulded.†

The hernial sac, like other serous membranes, may be thickened, indurated, and rendered opaque by inflammation.

Its various parts, as M. J. CLOQUET‡ observes, may also undergo fibrous, fibro-cartilaginous, cartilaginous, or osseous change of structure, either from inflammation, or from a change in the nutrition of the part consequent on pressure or other irritation. In the two former cases the membrane is thickened, opaque, whitish, and firm, with a more or less distinct fibrous structure, in which no blood-vessels are observed. This structure is frequently found

* J. CLOQUET, *Recherches sur les causes*, &c. Obs. 123 and 124; p. 140, 141. Pl. iv. fig. 3 and 5.

† *Ibid.* p. 58, Obs. 33. Pl. vi. fig. 2 and 3.

‡ *Ibid.* p. 145 et suiv.

in the neck of the sac, in the stigmata, and in the portions of membranes which have been frayed.

The cartilaginous alteration is generally partial, in the form of irregular plates, varying in number, form, size, and situation. They are sometimes thin and flat; sometimes thicker and projecting into the sac: there are instances in which the surface is covered by an immense quantity of very small white cartilaginous granulations. They are developed in the serous tissue exterior to the sac, and are covered by a very thin, smooth, and closely-adherent serous layer. They are hard, not easily torn, and formed of thin laminae, which can be readily separated; they are closely analogous to the cartilaginous plates so often found in the pleura, in old hydroceles, in some serous ovarian cysts, and in certain synovial membranes. They seem to grow by successive depositions on the exterior surface, and thus they gradually project more and more into the sac. They may become detached, and thus form loose bodies like those sometimes found in old hydroceles. They do not appear to possess blood-vessels: their formation is preceded by a visible vascular network, in the centre of which the cartilage is deposited, and, in proportion as it increases, the vessels retreat towards the circumference.

Ossifications of the hernial sac occur, either in the form of more or less considerable plates, or of thick and irregular masses. They resemble the calcareous depositions occurring in the arteries, the uterus, the thyroid gland, rather than the normal formations of bone. They dissolve almost entirely in muriatic acid, leaving at least a very slight residue, which cannot be compared to the gelatinous parenchyma of bone.

The serous surface of the sac and that of the protruded viscera frequently present black spots depending on a peculiar alteration of the peritoneum, and varying in tint, size, and position. They sometimes cover nearly the whole surface of the sac. It is necessary to be aware of their existence, that they may not be confounded, in operations, with the results of mortification.

Sometimes we find on the internal surface of the sac, red patches, like ecchymoses, formed by the deposition of blood, or of some red fluid in the texture of the peritoneum. Besides these black and red marks, others are seen of intermediate colours, dark red, or brown; and these several varieties may occur in one and the same sac. Probably

these various tints are only degrees of one alteration, the brown spots having been first red, and then subsequently becoming black. When these spots are attentively examined with the aid of a glass, they are found to be produced by the assemblage of minute points, which are distinct in the paler marks, confluent in those of deeper tint. Instead of being concentrated, these points are sometimes generally disseminated, so as to give the entire sac a tawny or grey hue.

Can the formation of these discoloured spots be ascribed to the effusion of blood, and to the various changes it may subsequently undergo?

“I calculate,” says M. CLOQUET, “that these black spots are found in ruptures once in fifteen or twenty times. I have seen them in inguinal herniæ of both kinds, in crural, and even in the remains of the tunica vaginalis. I have not met with them in other ruptures, but have seen them sometimes on the intestines and the abdominal parietes. I have sometimes seen a similar black matter deposited in the texture of adventitious membranes developed on the internal surface of the sac; these membranes may be detached in pieces which have some resemblance to portions of the choroid membrane. I have also seen patches of a clear black on the surface of mucous membranes.”*

* Page 152, 3. The notes contain the details of some facts illustrating the preceding remarks; and the appearance of the black spots is represented in pl. x. fig. 7 and 8.

CHAPTER II.

Causes of Ruptures.

THE causes of these complaints may be referred in general to two divisions, according as they appear to operate by increasing the pressure of the viscera, or by diminishing the resistance of the abdominal parietes. The former may be ranked, as *occasional* or *exciting*; the latter as *predisposing* causes of the complaint.

Alternate contractions of the diaphragm and abdominal muscles are the chief agents in producing the mechanical phenomena of respiration, and important auxiliaries in the functions of the principal abdominal viscera. The descent of the diaphragm, in inspiration, enlarges the perpendicular diameter of the chest, by pushing the abdominal contents downwards and forwards; the subsequent contraction of the abdominal muscles in expiration, carrying back the viscera, again diminishes the thorax. A regular succession of such motions constitutes ordinary respiration, in which the surface of the abdomen presents an uninterrupted series of alternate gentle elevations and depressions, the cavity itself being changed merely in form, not in size. In executing these motions, the containing and contained parts act and react on each other. The moistened and perfectly smooth serous surfaces of the viscera and parietes, enabling them to yield with the greatest facility, render the pressure of the respiratory muscles equable over the whole abdomen, as if it were exerted on a fluid; and this uniform distribution of the force is assisted by the readily yielding gaseous contents of the alimentary canal. The elasticity of the latter produces a reaction on the muscles, when their contraction has ceased. The general pressure thus produced maintains the viscera in their relative position.

The muscular contraction, and the resistance of the compressed parts, are suited to each other in the healthy natu-

ral state of the frame ; but the proportion is disturbed under various circumstances. A general increase of the contents produces a corresponding extension of the containing parts, as in ascites, tympanites, pregnancy, corpulence ; and a similar yielding of all the parietes may occur in a more limited space of the abdomen ; but neither of these cases comes properly under the description of a hernia.

The pressure which the viscera constantly receive from the respiratory muscles becomes greatly augmented by any considerable exertion, which is always attended with a forcible action of the expiratory and inspiratory powers at the same time. When such efforts are carried beyond a certain point, the parietes of the cavity give way to the impelling force at those parts where they are weakened by the holes for the transmission of blood-vessels ; and the viscera are thrust forth from their situation, carrying before them a portion of the peritoneum, which forms the hernial sac. Thus it is that ruptures are frequently produced by the act of lifting or carrying a heavy weight ; in running, or jumping ; in short, under any circumstances where considerable efforts are used. On such occasions the abdominal muscles and diaphragm are called into strong action, for the purpose of fixing the trunk, and affording a steady point of support to the limbs. In the case of straining, a person is said, in common language, to hold his breath ; that is, he first puts the diaphragm in action by a deep inspiration, and then contracts his abdominal muscles. The viscera, compressed by these two forces, escape, wherever an opportunity is allowed, provided the pressure exceeds the resistance offered by the ring, or crural arch. On these principles we can account for the observation concerning the greater frequency of ruptures among the inhabitants of mountainous countries,* with whom opportunities must frequently occur of exerting their strength and activity ; as well as for their being more common in the labouring

* The frequency of ruptures in Switzerland has been noticed long ago ; see FREYTAG *Diss. de Oscheo-entero-et-bubonocoele Helvetiæ incolis frequentibus* ; Argent. 1721. BLUMENBACH found them particularly numerous in a district of Appenzell, and ascribes their prevalence to the universal practice of violent gymnastic exercises by the young lads ; to a sport followed by the grown-up men, in which a stone, weighing eighty pounds or more, is poised by the right hand on the shoulder, and thrown forwards by a sudden spring of the whole body ; and to their practice of carrying home from their fields heavy loads of hay and other articles upon their backs.—BLUMENBACH, *Medicinische Bibliothek*, B. i. p. 725 ; RICHTER, *Chirurg. Biblioth.* B. viii.

classes of the community. For the same reason they are more frequent in the male than in the female sex ;* and on the right than on the left side of the body.†

The great numerical disproportion between right and left ruptures, does not depend on any disparity in size between the apertures of the two sides, but must be referred to the employment of the right side in those offices of life which require the most powerful exertion. M. CLOQUET,‡ who has considered this point more minutely, observes, that when we employ the right arm in lifting a weight, dragging, or any other considerable effort, we incline the chest towards the left so as to curve the trunk, and stretch the right abdominal muscles. The inferior surface of the diaphragm, which in the erect attitude looks downwards and forwards, is now inclined towards the right, so as to push the viscera, when it acts, towards the right iliac region, and thus to increase the distending force in a quarter, where, from the stretched state of the muscles, the power of resistance is already diminished.

The forcible action of the respiratory muscles in expelling the contents of the viscera, as in vomiting, straining at stool, and the act of parturition, may produce ruptures. In strictured patients I have seen herniæ formed gradually in consequence of the habitual efforts required for the evacuation of the bladder. Crying, and the whooping-cough, are frequent sources of the complaint in children.

All increase of volume in the abdominal contents, as distension of the alimentary canal by food or air, favours the production of ruptures. By causing pressure of the contained against the containing parts, it gives the former a tendency to escape. Thus any of the circumstances already

* From a Report of the City of London Truss Society, for the year 1835, it appears, that of 83,584 persons, to whom that institution had afforded relief, from the period of its first establishment, 67,798 were males, and 15,786 females. See *ante* p. 11. The New Rupture Society had relieved 3,505 males and 565 females.—*Medical and Physical Journal*, vol. xxxi. p. 168.

† Of the 83,584 cases mentioned in the foregoing note, 24,316 males and 586 females had right, 14,006 males and 511 females, left inguinal hernia: 3,256 females and 421 males, right femoral; 2,255 females and 278 males, left femoral hernia. In the New Rupture Society, the numbers of males and females, with right and left inguinal hernia, were, respectively, 1,563 and 51, 927 and 34; with right and left femoral hernia, 19 and 139, 11 and 93.

MONNIKHOF examined 885 persons (710 males, 175 females) with inguinal hernia. There were altogether 1,090 ruptures; 672 right, 418 left, 205 on both sides.—A. K. HESSELBACH, *Lehre*; p. 112.

‡ *Recherches sur les Causes et l'Anatomie des Hernies Abdominales*, p. 10—13.

enumerated will act more effectually after a meal, or when the abdomen is distended with wind. Thus, too, the viscera loaded with fat, in elderly and corpulent persons, slip out easily, and are retained with difficulty. Hence also the importance of avoiding costiveness in these complaints.

The protrusion of the bowels, at the ring and crural arch, is favoured by the position of these openings, as well as by the comparative weakness of the parietes; though it must be observed, that, in consequence of the obliquity of the inguinal canal, the pressure does not act in the direction of its axis. The diaphragm and abdominal muscles exert a firm compression above, at the sides, and in front, and thus impel the parts downwards and forwards, against the above-mentioned openings. When the upper part of the cavity is subjected to forcible external pressure, as by the application of tight-laced stays, the viscera are driven downwards, and the formation of an inguinal or crural rupture is much facilitated. That the consequences of this practice are not imaginary may be proved by dissection, which shows us an actual change of figure in the lower ribs, and sometimes the obvious marks of external pressure on the surface of the liver.

In the natural play of the respiratory organs, the front of the belly rises and falls in alternation with the descent and ascent of the diaphragm. When the abdominal muscles are put into strong action, the pressure is distributed over a large space, and cannot have any local injurious effect on the viscera. The injudicious application of tight clothing to the trunk of the body interferes with this process: by preventing the natural swell of the belly in the part which it embraces, it increases the effort in other quarters, and thus has a direct tendency to cause protrusions. Such must be the operation of the navel bandage, often applied to newly-born infants, but completely unnecessary; of high breeches, and of petticoats, when they encircle the body closely, and are not supported by braces; of the belts so much worn by men round the abdomen under the mistaken notion of strengthening the body; and more particularly of stays, when partly or wholly composed of unyielding materials, and tightly laced.

An observation of the wide space in the skeleton, constituting the inferior aperture of the pelvis, and forming the lower boundary of the abdominal cavity, would lead us to expect in this situation a frequent seat of rupture. Position

is here particularly favourable to its occurrence; and a forcible impulse is communicated to the hand at this part, whenever general pressure is exerted on the abdominal viscera. This opening is filled, in the recent subject, by the sacro-sciatic ligaments, and the levatores ani: the latter muscles forming a broad concave surface, which shuts up the front and sides of the pelvis at this part, and which, by replacing the viscera when protruded by the pressure of straining, constitutes an antagonist power to the respiratory muscles. A strong fascia, continued from the arch of the pubes to the prostate and neck of the bladder, prevents protrusions in that situation; while the bladder and rectum afford a considerable obstacle to the formation of ruptures in their neighbourhood. A descent of the viscera through the great sciatic notch is almost entirely precluded by the space being occupied by the pyriformis muscle, and the vessels and nerve which go through the opening.

The predisposing cause of ruptures has been referred to a naturally greater size of the openings at which they protrude; to weakness and relaxation of the margins of these apertures; and to preternatural laxity of the peritoneum.* The former circumstance has probably a chief operation; since in males, where the abdominal ring is naturally capacious, inguinal herniæ occur in great numbers, while the femoral species is rare; females, on the contrary, having the capacities of these apertures reversed, are seldom affected with inguinal ruptures. Without, however, attempting to decide what is the true reason, it may be safely asserted, that particular subjects manifest an unquestionable disposition to the complaint. In such persons a very slight occasional cause, such as the act of coughing or sneezing, will bring on a rupture; the complaint, indeed, sometimes appears spontaneously. "I know," says RICHTER,† "a savant, who leads a sedentary life, and in whom an inguinal hernia appeared suddenly some time ago. I applied a bandage, and in a few weeks a similar hernia came on the opposite side; a bandage was applied to this also; and in

* "Cette foiblesse, cause prédisposante des hernies, consiste, ou en une laxité contre nature du péritoine, qui, dans les endroits, où il n'est pas soutenu par les muscles du bas-ventre, comme à l'anneau, cède à la distension: ou en un relâchement et une extensibilité contre nature du mésentère et de toutes les parties, qui maintiennent les viscères du bas-ventre dans leur situation."—RICHTER, *Tr. des Hern.* p. 10.

† *Traité des Hernies*, p. 9.

a very short time a crural hernia made its appearance. I have seen several similar cases; and have known four or even five herniæ come in the same subject, without the least occasional cause." DR. MONRO mentions a gentleman, fifty years of age, who had an umbilical hernia from infancy. At four years old he received a blow in the groin, and bubonocoele followed: eight years afterwards a hernia occurred in the other groin without apparent cause. In another person he found four herniæ; two crural on the right side, one on the left side, and a pudendal hernia.* A man, forty years of age, who presented himself at the Hôtel Dieu, had five herniæ; two inguinal, two crural, and an exomphalos. He was of good constitution; and there was no apparent cause for these swellings, which had existed from infancy.† The necessity of admitting some original difference of structure favourable to the occurrence of ruptures is apparent from this consideration, viz. that the openings exist in all subjects, and the occasional causes are applied in all individuals; but the effect is produced only in certain cases.

In those who have passed the middle period of life, ruptures frequently take place without any obvious exciting cause, or any ascertainable predisposition: the complaint is formed gradually, and without pain, and the attention of the patient is first excited by the presence of the swelling.

When it is stated, that hernia has sometimes appeared to be hereditary, the meaning of the observation must be, that there is a certain weakness in the original formation of the parts, predisposing to the complaint, and that this defect may descend to the offspring; and in this sense its truth cannot be disputed.‡ I believe that the word *hereditary*, in its application to disease, has been always used according to this interpretation; and that the employment of it in its strict sense has only been suggested by those, who wished to show their ingenuity in refuting an absurdity of their own creation.

The dilatation of the openings, through which herniæ

* *Morbid Anatomy of the Gullet*; p. 374.

† *London Medical Gazette*; vol. i. p. 70.

‡ "On ne peut point nier, que cette cause prédisposante des hernies ne soit héréditaire: je ne prétends pas plus que des pères attaqués des hernies engendrent toujours des enfans, qui seront affectés de cette maladie, que je ne pretends, qu'ils engendrent toujours des enfans, qui leur ressemblent: mais on observe quelquefois l'un et l'autre. J'ai vû des hernies survenues spontanément, et sans aucune cause extérieure, à des enfans, dont les pères avoient des hernies."—RICHTER, lib. cit. p. 10.

take place, in consequence of the distension of the abdominal parietes during pregnancy, accounts for the greater frequency of ruptures in general, and of the exomphalos in particular, in women who have borne children. The occurrence of umbilical hernia, after dropsy, may be explained on the same ground.

The ruptures which appear after debilitating diseases, and those which occur in persons, who, from a state of corpulency, become suddenly emaciated, must be referred to weakness.

CASE.—A friend of mine met with a remarkable instance of the latter kind in a French emigrant: the danger, anxiety, and fatigue, which this unfortunate gentleman experienced in escaping from his native country, and the extreme indigence to which he found himself reduced on his arrival in England, brought him from the good condition, which the luxurious table of affluence had produced, to a state of considerable emaciation; and a hernia took place at each groin.

Penetrating wounds of the abdominal parietes have been considered as strongly predisposing to hernia. Such cases are not sufficiently common in general practice, to enable me to decide. I do not remember to have seen this effect produced in any instance. RICHERAND observes, on this subject, that herniæ seldom fail to occur, however firm the cicatrix may be, unless a bandage be employed as a means of prevention: and that they may be expected with certainty after any considerable bruise, which destroys the powers of resistance (*ressort*) of the parietes.* He mentions a case in which there was a sabre wound, about an inch in length, in the right hypochondrium, which healed regularly. The patient wore no bandage after his recovery, and at the end of eighteen months there was a hernial swelling, equal in size to two fists. This could be easily replaced and retained.†

Those attitudes of the body, in which the tendinous apertures at the ring and crural arch are stretched, as when the trunk is thrown backwards on the thighs, and the chest extended on the pelvis, are favourable to the occurrence of ruptures; because the abdominal muscles, in

* *Nosographie chirurg.* tom. iii, p. 317.

† *Ibid.* p. 319. A case of ventral hernia following the wound made for evacuating an abscess in the abdomen, is mentioned in the first vol. of SCHMUCKER's *Miscellaneous Writings*, p. 197.

this tense state, both enlarge the apertures, and press on the viscera. A strong exertion of the respiratory powers, in such a position, is likely to cause a rupture. In violent horse-exercise, particularly without stirrups, this attitude, and the exertions of the abdominal muscles, concur with the perpendicular pressure of the viscera, to cause protrusions at the groin, or crural arch. Hence cavalry are ruptured in a much greater proportion than foot-soldiers.

From the circumstances just explained, a particular manœuvre, practised by the infantry, in which the men suddenly sank on one knee, keeping the trunk erect, was found very injurious by producing ruptures. SOEEMMERRING* states, that more than twenty recruits were ruptured in this way, on one occasion, at Mentz; all of them fine, healthy, stout peasant lads. Their high and tight breeches, and closely fastened circular belts, by compressing the upper part of the belly, considerably increased the danger.

It would be tedious to enumerate every trivial circumstance, which may occasionally contribute to the formation of a rupture. The preceding general view will enable the reader to understand the subject sufficiently. Some of the causes, assigned by systematic writers, are totally inadequate and even ridiculous. In the respectable work of RICHTER, which deserves, on the whole, much commendation, the origin of herniæ is attributed to the use of relaxing and aqueous liquors, of fat and oily kinds of food; to moisture of the climate, &c. Fish, coffee,† potatoes,‡ and even milk,§ have not escaped the imputation of favouring the formation of these complaints.

* *Ueber Ursache und Verhütung der Nabel—und Leistenbrüche*, p. 41.

† SOEEMMERRING, *über Ursache und Verhütung*, &c. p. 52.

‡ The following curious specimen of pathology, in which such injurious effects are ascribed to their favourite and principal article of diet, will probably amuse our Lancashire and Irish fellow-countrymen.

“Inasmuch as potatoes are an indigestible kind of food, distending the intestinal canal without affording sufficient aliment, and, according to general opinion, by producing a coarse kind of chyle, cause swellings of the mesenteric glands, they appear to debilitate the digestive organs, and thus cause a predisposition to ruptures, particularly as country children eat them now more commonly, and in a worse state, than heretofore.”—SOEEMMERRING, *über Ursache und Verhütung der Nabel—und Leistenbrüche*, p. 58.

§ BLUMENBACH assigns, as one reason for the general prevalence of ruptures among the Swiss, their constant and almost exclusive employment of articles of food derived from milk, which they have the art of varying to a great extent, by different modes of preparation. Whey is their common drink. In many of the higher parts of the Appenzell Alps, you get nothing to eat but old cheese, with new cheese instead of bread. Probably, he adds,

Herniæ, which originate in predisposition, generally come on gradually, and almost imperceptibly; while those which are produced by bodily exertion are formed suddenly, and by the immediate action of the exciting cause. The occurrence of the complaint is often indicated in the first instance by a fulness, combined with a sense of weakness and uneasiness about the abdominal ring. The swelling is increased by any action of the respiratory muscles, and is therefore rendered more sensible by coughing or holding the breath, and disappears on pressure, and in the recumbent position of the body. It gradually finds its way through the tendon of the external oblique muscle into the groin, and afterwards into the scrotum. When a hernia takes place suddenly, it is generally attended with a sensation of something giving way at the part, and with pain.

the milk diet of the Dutch is a principal reason of the great number of ruptures observed among them.—*Medicinische Bibliothek*, band. i. p. 729.

It seems strange, that a single Irishman should escape the united operation of the milk and potatoes. Since, however, ruptures are by no means particularly frequent in Ireland, where nineteen-twentieths of the population subsist on those very articles, either its natives must enjoy some peculiar exemption, or the learned writers quoted above must be mistaken.

CHAPTER III.

Symptoms of Ruptures in their various states.

SECTION I.—SYMPTOMS OF A REDUCIBLE RUPTURE.

WHEN the contents of a rupture experience no pressure from the margins of the opening through which they have passed, their functions are little, if at all, impeded ; the description of the disease consists, therefore, chiefly in an enumeration of the sensible characters of the tumour. When, on the contrary, the hernia is obstructed, inflamed, or strangulated, the natural offices of the protruded parts are interrupted or suspended ; hence various dangerous and alarming symptoms ensue, by which the character of the complaint is completely changed.

If we meet, in any of the usual seats of hernia, such as the groin, scrotum, labia pudendi, or navel, with an indolent tumour, more or less firmly connected at its basis to the parts below, so that we cannot pass the fingers completely under it, either soft, or more tense and elastic, without change in the colour of the skin, which is moveable, and can be pinched up into folds and elevated ; and if it have arisen under the circumstances generally attending the formation of this complaint, we naturally ascribe its origin to a protrusion of the abdominal viscera. Our suspicion is converted into certainty, if we find that the swelling varies in size ; being smaller in the recumbent position, larger in the erect posture, or when the patient holds his breath ; diminishing or entirely disappearing when he lies down, or under pressure ; showing itself again, or enlarging when he resumes the erect attitude, or when the pressure has ceased ; if it be large and tense after long standing, much exercise or straining, after a meal, or when the patient is troubled with wind ; soft and small in the morning, before he has taken any food : if, since the commencement of the complaint, he have experienced any

affections, arising from the unnatural situation of the viscera, as colic, constipation, or vomiting; if he perceive occasionally a rumbling sensation in the tumour, particularly on its return; and lastly, if it become tense when he coughs, so that an impulse is communicated to the hand of the examiner.

The tumour goes up of itself, or on slight pressure, in the lying position; it may be returned, when the patient is erect, by pressing it more or less forcibly. The natural opening of the abdominal parietes, to which the tumour corresponds, being occupied by a soft body, cannot be recognised before its replacement; but, in general, we can distinguish it afterwards, and even sometimes introduce the finger, so as to find that it is dilated.

These, which may be called the general symptoms of herniæ, are not all observable in every species and state of the complaint: each kind has its particular signs, as I shall explain hereafter. But in most instances, the circumstances which have preceded or accompanied its origin, and the affections, which have followed its appearance, will enable the surgeon to determine the nature of the tumour.

The symptoms of the case will sometimes inform us what are the contained parts. This discrimination, indeed, is often difficult, and even impossible, when the hernia is old, large, and tense. For the viscera in such ruptures experience considerable changes in their figure and state, while the thickened hernial sac prevents an accurate examination by the hand. Again, it is frequently difficult to determine the contents of a small hernia.

If the surface of the tumour be uniform; if it be elastic to the touch; if it become tense and enlarged when the patient is troubled with wind, holds his breath, or coughs; if, in the latter case, it feel as if it were inflated; if the part return with a peculiar noise, and pass through the opening at once, the contents of the swelling are intestine. If the tumour be compressible; if it feel flabby, and uneven on the surface; if it be free from tension, under the circumstances just enumerated; if it return without a noise, and pass up gradually, the case may be considered an epiplocele.

The smooth and slippery surface of the intestine makes its reduction easier; and the mixture of air with the intestinal contents, causes, when they are pressed up, a peculiar

gurgling* noise. A case is related, in the chapter on omental ruptures, in which the tumour, considered certainly both from its sensible characters and symptoms to be intestinal, proved on operation to be omental. The reduction of the omentum is more difficult, since it is soft and uneven, and its surface becomes moulded by the surrounding parts. If a portion of the contents slip up quickly, and with noise, leaving behind something which is less easily reduced, the case is probably an entero-epiplocele.

The circumstances above enumerated do not enable us to determine, in all cases, what are the contents of a hernial swelling. PETIT, after stating, with the candour characteristic of true science, that he had been frequently mistaken in his opinion, delivers the following very sensible observations, which it will be well for the young practitioner to bear in mind on other occasions, as well as the present:—

“Let young surgeons acquire a habit of caution from what I now say; let them reflect before they speak or act, and remember, that there is often a great difference between what a person really sees, and what he fancies that he sees. Speaking too hastily may be followed by bitter regret; but we very seldom repent of having been silent. Those who run after reputation do not always overtake it: the merit on which it is founded is like fruit, which ought not to be gathered until it has attained maturity.†

“I have experienced what I say more than once, and doubt not that others have met with similar occurrences. From having been deceived in my judgment, I am no longer so ready to offer a prognosis; for, by the confession of the greatest practitioners, few herniæ resemble each other exactly. Those, who have not seen much, will not be disposed to believe what I say; they will imagine that nothing more is required, in order to determine the nature of a rupture, than to know what authors state concerning the signs which indicate the presence of intestine or omentum; but they deceive themselves.”‡

The circumstances, which have just been enumerated,

* Our words *gurgle* and *gargle*, which are allied in sense as well in sound, are from the French *gargouiller*, or the Italian *gorgogliare*, which is derived from *gorga*, the throat, or *gorgo*, a whirlpool, the latter being little changed from the Latin *gurgēs*. Hence *gurgle* is applied to the motion of a liquid when its stream is interrupted by obstacles, or broken by the admixture of air.

† *Tr. des Malad. chirurg.* tom ii. p. 311.

* *Ibid.* p. 308.

characterise the complaint so perfectly, that no doubt can exist as to its nature; there can be no fear of confounding it with other disorders, if we advert to their origin, progress, and symptoms. The nature of the case is more doubtful, if the swelling be small and deeply-seated; if it have arisen gradually; if it be connected with other tumours; if it contain much fluid, and the patient be fat. Here the greatest attention and discernment are required on the part of the surgeon; his opinion must be guided rather by the symptoms, than by the characters of the tumour.

A reducible hernia, though attended with no immediate danger, occasions much trouble to the patient, particularly if it be allowed to proceed unrestrained by surgical treatment: and the inconvenience increases with the size of the tumour. The portion of intestine or omentum, which has left the abdomen, produces various complaints from its connexion with the parts within. From this source of irritation proceed nausea and vomiting, indigestion, and colic. As the viscera become accustomed to their unnatural situation, these symptoms gradually wear away. Still, as the tumour increases in size, a large part of the viscera is deprived of that pressure and support, which they should derive from the respiratory muscles; the passage of the food through the alimentary canal becomes difficult and protracted; hence large ruptures are almost invariably attended with flatulence and constipation. The patient is thus, in a great measure, prevented from following active and laborious employments, and from using considerable exertions, which necessarily augment the tumour, and are attended with more immediate danger, by forcing down fresh parts, so as to cause strangulation. The opening, through which the viscera pass out, must subject them to more or less pressure: this will enable us to account for that effusion of fluid into the sac, which is generally observed in old ruptures, and for the formation of those adhesions, which change the case from a reducible swelling, to one no longer admitting of reduction. Since the opening becomes enlarged by the protruded parts, and the pressure on the viscera, which causes the descent, is frequently renewed, additions to the tumour take place readily. In situations, where position is favourable, and the surrounding parts offer no obstacle, as in the scrotum, the only limit to the possible bulk of a rupture arises from the

connexions of the parts within. Instances are not uncommon where all the moveable viscera have been contained in such a swelling; and even those, which are more fixed, may be gradually displaced by the constant dragging of organs connected with them.

SECTION II.—SYMPTOMS OF A STRANGULATED RUPTURE.

THE immediate effects of such pressure, as prevents the return of the protruded parts, are, an obstruction to the passage of the intestinal contents, with consequent want of fecal evacuations, and inflammation of the strangulated portion. When the stricture becomes tighter, it impedes the flow of blood in the vessels of the protruded parts, and the pressure at last is so considerable, as to arrest the circulation.

The constipation may not be so clearly marked, where a part only of the diameter of the gut is strangulated, but it will often occur to as great a degree in that case, and will be equally insuperable by purgative medicines,* as where a complete fold of intestine is included: it even happens occasionally in a mere epiplocele, where no intestine is protruded. Hence it must be referred rather to that inflammatory affection of the intestines, which subsists in this complaint, than to the mechanical obstruction of the canal; and must be considered as analogous to the constipation, which prevails in ileus when produced by other causes.

In the following case, all the symptoms of strangulation, including obstinate constipation, were present, although the protruded portion of bowel was so small as hardly to diminish the size of the canal.

CASE.—WILLIAM BATES, forty-three, was admitted into

* MORGAGNI mentions a case, in which a part only of the diameter was included, where the stools were not suppressed; yet it ended fatally; *De causis et sed.* Ep. xxxiv. Art. xv. Many instances are recorded in which the constipation has been complete. *Mém. de l'Acad. de Chirurg.* tom. iii. p. 151; *London Med. Obs. and Inquiries*, vol. iv. p. 178 and 355; *Philosophical Magazine*, vol. xxxi, p. 214, et seq.; *De HAEN Ratio Medendi*, p. ii. c. iv.

A patient of MORGAGNI's died on the sixth day, after constipation continuing for the whole time; the entire diameter of the intestine here was unobstructed, the protruded part being merely a diverticulum.—Ep. xxxiv. art. xviii. He quotes a similar case from BENEVOLO *Due Relazioni Chirurg.* art. xix.

ST. BARTHOLOMEW'S Hospital, on the 1st of April, 1827. Between two and three months previously he first noticed in the left groin a tumour, slightly painful, about the size of a hazel nut. The bowels have been irregular since its appearance. On the 28th of March the tumour became rather larger, and painful when touched; hiccup, nausea, and vomiting came on, and have continued, in spite of various medicines and venesection to six or eight ounces. April 1. A tumour in the left groin, as large as a small walnut, painful; the pain extending across the abdomen, which is tense, and painful when touched. Hiccup, nausea, and occasional vomiting. The bowels not relieved since March 27. The warm-bath, aperient medicine, and venesection to sixteen ounces, were employed without benefit; and the operation was performed at 1 p. m. on April 2nd. A portion of intestine about as large as a filbert was found protruded through the femoral ring; it was dark brown, like the colour of a tamarind stone, and slightly but generally agglutinated to the sac, from which a small quantity of fluid escaped. A silver director was carried into the abdomen on the inner side of the gut, and GIMBERNAT'S ligament was divided horizontally inwards by means of SIR A. COOPER'S curved bistoury carried on the director. The bowel was replaced easily, but presented again at the orifice, so that a careful examination was made, by introducing the finger, to ascertain that the part was quite free. The symptoms were not relieved; no discharge took place from the bowels, and death ensued nine hours after the operation.

Examination.—On separating the edges of the wound, a portion of intestine, smaller and less discoloured than at the time of the operation, was observed at the neck of the sac, to which it was slightly agglutinated. It was not compressed by the margin of the aperture, and it fell out in handling the parts after their removal. The abdomen, as large as before the operation, was nearly filled with numerous convolutions of distended small intestine, consisting of the portion of the canal above the protrusion, the seat of which was in the ilium about twelve inches from the cœcum. The intestinal tube was rather contracted below the protruded part. The latter consisted of a portion not larger than the end of the forefinger. It was dark, a little thickened, but not essentially changed in structure: the discoloration and thickening were gradually lost in the sound

intestine. The mucous membrane was quite healthy, and there was no impression of the stricture on the coats of the bowel. The canal was laid open at the seat of the stricture, and for a few inches above and below. A slightly prominent fold was observed in the mesenteric aspect of the canal at the seat of the protrusion, but it hardly produced a sensible diminution of the calibre: the costiveness therefore could not be accounted for, in this case, by mechanical obstruction. The peritoneum generally was sound. The serous covering of the small intestine above the hernia exhibited slight appearances of incipient inflammation. There were a few longitudinal red streaks, and the adjacent convolutions were slightly agglutinated in two situations. The small portion in the mouth of the sac was slightly adherent; but the immediate continuation of the canal was completely free from inflammation and adhesion. The incision of the stricture, not more than one-third of an inch in length, had included the neck of the sac and GIMBERNAT'S ligament, passing directly inwards.

The administration of a clyster often produces a stool after strangulation has taken place; but when the bowels below the stricture have been once emptied, the repetition of injections produces no further effect.

Inflammation of the protruded viscera causes thickening of their coats, and effusion of fluid into the hernial sac. When it is more violent, coagulating lymph is poured out, which, becoming organised, causes adhesion of the parts to each other or to the containing bag.

The coats of the intestine are seriously injured by the mechanical pressure of the stricture, more particularly when the protrusion is wholly intestinal. A manifest impression is often made on the gut, as if it had been firmly tied by a small hard cord; when the pressure has been long continued, the internal coats are sometimes ulcerated, and thus the gut is so much weakened, that a slight force, such as that necessarily employed in handling and returning the parts, occasions it to give way; or it may burst after being replaced, giving issue, in either case, to its contents. The pressure sometimes causes constriction of the canal, without any division or weakening of its sides.* Some further re-

* In a patient who died with insuperable constipation, and all the symptoms of ileus, I found the small intestine surrounded at one point by a preternatural adhesion, consisting of a firm and roundish cord. The canal was here permanently contracted, so as not to exceed a large quill in diameter. M.

marks on this subject will be found in Chapter XVI., among the observations on the operation for strangulated femoral hernia.

The strangulation terminates, unless the stricture be previously removed, in gangrene. These, which we may call the direct effects of the stricture, are accompanied by other symptoms, arising from disorder of the parts, which sympathise with the hernia.

In an incarcerated intestinal rupture, the tumour, which was before indolent, becomes painful; the pain is most acute at the strictured portion, and extends from that situation over the rest of the swelling and abdomen; these parts becoming at the same time swollen and tense. A feeling of tightness, as if from a cord drawn across the upper part of the belly, is often one of the earliest symptoms of strangulation. The pain, which at first is not constant, becomes in the sequel fixed; and is augmented by external pressure, coughing, sneezing, or other agitations of the body. The evacuations *per anum* are entirely suppressed, and nausea and vomiting ensue: all the contents of the stomach, and afterwards those of the intestine, down to the stricture, being rejected.* These symptoms, which often

RITSCHE found it completely closed in a case of hernia.—*Mém. de l'Acad. de Chirurg.* tom. iv. *Sur un effet peu connu de l'étranglement dans la hernie intestinale.* See also MONRO *on Crural Hernia*, p. 17, and pl. v. fig. ii. The colon so contracted that it would not admit the finger, without any inflammation; SCARPA, p. 116.

* This constitutes what is termed *stercoraceous* vomiting: it consists, probably, in general, of the contents of the small intestines. A consideration of the valvula coli would induce us to suppose that the contents of the large intestine could not pass into the small: but repeated observation has shown that this valve does not offer an insuperable obstacle. “*Probatissimi auctores hoc observaverunt, et ipse manifestè vidi,*” says HALLER.

HEBERDEN has seen clysters vomited up in a case of hernia; and adds, that he has frequently witnessed it in ileus.—*Medical Transactions*, vol. ii. p. 514. The testimony of DE HAEN may also be quoted.—*Rat. Med.* part ii.

MR. KEY says, “It is a generally received opinion that the contents of the intestines do not assume a decidedly feculent character until they have passed the valve of the colon, and are exposed to the action of the secretions of the large intestine. Such perhaps may be the case in the ordinary, healthy and active peristaltic motion of the intestines; but under strangulation, when the passage of the contained matters is impeded, they become feculent even in the ileum, as I have had opportunities of observing in cases of artificial anus succeeding the operation, in which dissection has afterwards shown the strictured portion to have been the lower part of the small intestine; to account, therefore, for the stercoraceous vomiting, we need not have recourse to the retrograde passage of the contents of the large intestine through the valvula coli; although the well-attested fact of clysters being vomited proves the possibility of the occurrence.”—SIR A. COOPER, part i. p. 28; ed. 2, note.

remit for a considerable period, are accompanied by a proportionate derangement of the whole system. There is great anxiety and restlessness, with a small quick and hard pulse, and coldness of the extremities. The pulse cannot be at all depended on, as indicating the degree of general disturbance. It may be even slower than in health, when the patient is in the greatest danger. Neither does the degree of heat as ascertained by our examination, or indicated by the patient's sensations, correspond to that of fevers in general: on the contrary, there is a disposition to cold sweats, and cold state of the extremities. After a time hiccup supervenes, the pulse becomes so small as to be hardly sensible, the respiration is weak, and the whole body is covered by a cold and clammy sweat. Mortification now takes place: it begins in the contents of the rupture, and extends to the containing and neighbouring parts. The degree and intensity of the symptoms are modified by various circumstances, as the age and strength of the patient, the nature of the strangulation, &c. The duration of the complaint, from its first commencement to the termination in mortification or death, is also extremely various.

An epiplocele is much less liable to strangulation than an intestinal rupture, and its symptoms are milder and slower in their progress. In this variety of the complaint, stools may generally be procured by purgative medicines or clysters. The connexion of the omentum with the stomach induces hiccup and sickness, and although the latter symptom seldom proceeds to stercoraceous vomiting, it exists to a most distressing degree, and particularly characterises the complaint. The symptoms are often influenced by the position of the body, being mitigated by bending, and aggravated by straightening the trunk. An epiplocele is occasionally accompanied with all the dangerous and alarming symptoms of an intestinal rupture, as insuperable constipation and fecal vomiting.

The examination of a patient, who dies while labouring under a strangulated hernia, discloses such a state of parts as the symptoms just enumerated would naturally lead us to expect. The surface of the peritoneum is inflamed, and the intestines participate in this disorder, particularly the portion of the canal above the stricture, which is distended considerably beyond its natural diameter. From the constricted part downwards, the intestine is generally smaller than usual, and not inflamed. The convolutions of the in-

testinal canal are agglutinated by a recent deposition of coagulating lymph; and a turbid puriform fluid, with coagulated flakes, is effused into the abdomen; streaks of a bright red colour, consisting of an aggregation of minute vessels, run along the intestines near the points of contact between the convolutions; and spots of gangrene are not unfrequently observed. All these circumstances show us most decidedly, that the effects caused by strangulation are of the most active inflammatory kind. We must regard the stricture, which the protruded parts experience, as the immediate cause of this disorder.

The distinction of strangulation from affections, which may resemble it more or less nearly, requires considerable attention and judgment. The intestine included in a large hernia may be affected with colic, and thus give rise to constipation and vomiting. This may be the more easily mistaken for strangulation, if the parts are adherent, and incapable of reduction. Such an attack may render a reducible hernia incapable of being replaced; particularly if the bowels are much inflated. Clysters and oily purgatives will produce stools under these circumstances; and thereby throw light on the real nature of the case.

The first appearance of a rupture may occasion hiccup, vomiting, and pain: and the same symptoms may be exhibited in an old case, after the patient has taken much exercise, or remained long in the erect posture, in consequence of irritation excited by the protruded viscera in the contents of the abdomen. Here, too, stools may be easily procured by purgatives.

The most important case, however, is where a patient with a rupture has an attack of ileus from some other cause, in which the original complaint is not at all concerned. The operation, performed on the supposition that the symptoms arise from the hernia, would here be not only useless, but even injurious; and the surgeon would neglect those means, which the inflammation of the bowels so urgently demands.

Wherever we see a patient labouring under the symptoms of ileus, we should suspect the existence of a rupture, and make those inquiries and examinations, which such a suspicion would naturally suggest, particularly in females, who are often led to concealment by false delicacy. A superficial examination is not sufficient on these occasions; as a small portion of intestine, not forming any exter-

nal tumour, may, by its incarceration, cause the symptoms. If the latter have appeared suddenly, and under circumstances which might cause a rupture ; if the pain have been first felt about the ring or crural arch, and if pressure in these situations increase it ; and, lastly, if the patient, shortly before, had been in perfect health, there is strong reason to suspect the existence of a hernia.

Incomplete inguinal herniæ are those, of which the existence is most likely to be overlooked, as will appear from the cases mentioned in Chap. IX. Sect. 3, on the anatomy of that rupture, and in Chap. X. Sect. 1, on its symptoms and diagnosis. Small femoral and umbilical herniæ may also escape notice in fat persons ; an instance of the latter kind is mentioned at p. 64 ; and examples of the former are spoken of in the section on the diagnosis of femoral hernia.

M. VELPEAU says, “ Ces sortes de méprises sont loin d'être rares, même sans que la hernie soit très petite. Il y-a quelques jours un chirurgien des environs de Paris est appelé près d'un malade qu'il croit atteint d'une gastrite et qu'il traite en conséquence. Les accidens persistent. On fait venir un second chirurgien, qui reconnaît une hernie étranglée. La domestique d'un dignitaire de l'état mourut l'année dernière d'une prétendue inflammation d'entrailles : c'était d'un étranglement herniaire, qui ne fut reconnu qu'après la mort ! Un homme fort et robuste est pris de violentes coliques et de mouvements convulsifs ; on croit a une gastrite. Sangsues à l'épigastre et le reste sont ordonnés pendant trois jours. On le transporte à la Pitié. Il avait une bubonocèle que je pus réduire sur-le-champ ! Un peu plus de savoir ou de précautions, en pareil cas, préviendraient aisément l'erreur.

“ En 1817, une femme, directrice d'infirmierie à l'hôpital de Tours, est atteinte, dans la nuit, de coliques, de vomissemens, &c. Je l'interroge. Elle n'avait jamais eu de descente. M. BRETONNEAU l'explore le lendemain. Nulle trace de tumeur à l'abdomen ni aux aines. Cependant la douleur augmente sous la pression du pli de la cuisse, et c'est de là que semblent partir les coliques. On soupçonne une étranglement ; mais que faire ? On attend. La mort a lieu la nuit suivante. Une portion intestinale, du volume d'une noix, était étranglée dans l'anneau crural gauche, et ne faisait aucun relief, à l'extérieur.”*

* *Nouveaux éléments de méd. opérat.* Tom. ii. p. 330, 331.

When a person labouring under ileus has a hernia, which can be reduced easily, there is no ground for doubt; if, on the contrary, the parts cannot be replaced, strangulation may be reasonably suspected, although we cannot immediately conclude, with certainty, that the swelling is the cause of the inflammation. We should first ascertain whether the parts could be replaced previously to the attack; if they could not, and the swelling be large and old, they are probably adherent; and the impossibility of reduction proves nothing. If they could be returned, and particularly a short time before the access of the symptoms, strangulation may be suspected with justice; but it is still not quite certain. The two following cases, related by Mr. PORT,* show the possibility of mistake, and will forcibly inculcate the necessity of minute attention to the circumstances.

CASE I.—“An old gentleman, who had for many years had an irreturnable rupture of the mixed kind, and which I had often seen, was seized with the symptoms of an obstruction in the intestinal canal.

“He complained of great pain in his whole belly, but particularly about his navel; he was hot and restless, and had a frequent inclination to vomit; his pulse was full, hard, and frequent; and he had gone, contrary to his usual custom, three days without a stool.

“I examined his rupture very carefully; the process was large and full, as usual, but not at all tense or painful upon being handled; his belly was much swollen and hard, and he could hardly bear the light pressure of a hand about his navel. Upon mature consideration of the whole, I was of opinion, that his rupture had no share in his present complaints. But as some of his symptoms resembled those of a stricture, I desired that more advice might be had. A physician and surgeon were called: I gave them an account of what I had seen of the case, of my opinion concerning the irreducibility of the rupture, and that it had no share in the present complaint; at the same time desiring my colleague to examine for himself. We tried at reduction without success; but he thought that there was still a stricture. The Doctor ordered bleeding, clysters, and cathartics: the last were immediately rejected by vomit, and the clyster came away without any mixture of fæces. Bleed-

* *Works*, vol. iii. p. 304 and 307; edition of 1783.

ing was repeated *ad deliquium*, the tobacco smoke was injected, but all to no purpose. The operation was proposed, but as the case did not appear to me to require it, I could not second the motion ; it was, however, mentioned to the patient, who would not consent, unless I would say that I thought it necessary, and believed it would be successful : I could not say either, because I believed neither. Everything else that art could suggest or practise was tried ; but on the sixth day he died.

“ As it had been supposed that I was wrong and positive, I was very glad that his friends chose to have him opened.

“ The hernial sac was thick and hard, and contained a large portion of omentum, a piece of the ileum, and a portion of the colon, all perfectly sound, free from inflammation or stricture, and irreturnable only from quantity. But the intestine jejunum was greatly distended, highly inflamed, and in some parts sphacelated.”

CASE II.—“ JOHN DEWELL, a man about thirty, was brought into ST. BARTHOLOMEW’S, labouring, as was supposed, under an incarcerated hernia. He had not had a stool for three days, although he had taken both purges and clysters ; he vomited almost incessantly, his pulse was hard and frequent, but not full, and his countenance bespoke death.

“ He had a rupture ; it was on the right side, was clearly intestinal, was soft, easy, occasioned no pain upon being handled, and seemed to be capable of reduction ; but, after many trials, I found that I could not accomplish that end, notwithstanding I used my utmost endeavours ; all which gave the man no uneasiness, and therefore satisfied me that his symptoms did not arise from his hernia, which was also the patient’s own opinion.

“ MR. NOURSE coming into the ward, I desired him to look at the man : he thought, that, notwithstanding the seemingly quiet state of the rupture, a small portion of the gut might be so engaged, as to cause his present mischief, and therefore that the operation was warrantable and proper.

“ Supposing it to be right at all, it could not be done too soon, and therefore we set about it immediately.

“ The hernial sac was formed by the tunica vaginalis ; it contained a portion of intestine ileum, which had contracted a slight cohesion with the testicle, but was so perfectly free

from stricture, that when we had loosened it from its connexion, we returned it into the belly without dividing the tendon.

“I was indeed afraid that the man would have died before we could have got him to bed, but he lived till the next day.

“A portion of the colon within the belly had been in a state of inflammation, was now plainly mortified, and quite black.”

The following circumstances will enable the practitioner to decide, in similar cases, that the symptoms are not produced by the hernia; that it is not strangulated; and that the ileus arises from an internal cause. The pain is felt in the abdomen, and not in the swelling, which continues soft, while the belly is inflated, hard, and tense. The attack is sudden, and not preceded by any of the occasional causes, which could affect the rupture; and the ring is free. The affection extends in the sequel to the swelling, which then becomes painful and tense: but it appears later here than in the belly, and does not proceed to so great a degree.

SECTION III.—SYMPTOMS OF OBSTRUCTED AND INFLAMED RUPTURES.

Obstructed hernia—In some cases, where the functions of the bowels have been suspended, and the other usual symptoms of strangulation have been present, it has been found, on operation or examination after death, that no stricture has existed. The conclusion is obvious, that the pressure of stricture is not the only cause capable of interrupting the action of the bowels in ruptures. This leads us to the important pathological and practical inquiry, what the source of the mischief is in such instances.

MR. STEPHENS* has published observations intended to show that cases of this kind occur frequently, and that adhesions of the intestine are the cause of the disorder which closely resembles and is usually referred to the effect of

* *A Treatise on obstructed and inflamed hernia, and on mechanical obstructions of the bowels internally*; London, 8vo. 1829. Also, *Appendix, with additional cases and observations*; 1831.

strangulation. He acknowledges that the distinction between obstructed and strangulated hernia is very often not well defined, and that the two causes, namely, adhesion and stricture, are so mingled, that it is difficult to decide which has the primary share in the production of the symptoms. He says, "all previously reducible ruptures, which have suddenly descended, producing symptoms of ileus, are without doubt caused by a stricture; but all large and irreducible herniæ, which have, for some time previously, caused pain, particularly after meals, and have produced occasional obstructions in the bowels, are most probably connected with adhesions. The tumour is also generally less tense, the symptoms not so acute, and the abdomen not so soon painful, in cases of obstruction, as of strangulation."* He considers that these serious consequences of adhesion of the bowel to the sac are most common in umbilical and ventral hernia.

MR. STEPHENS relates at considerable length the particulars of two cases, which came under his treatment, and relies principally on the evidence they afford in proof that the intestinal canal may become obstructed without the presence of stricture, and that adhesion of the intestine is the usual cause of such obstruction.

A woman became affected with sickness, pain in the bowels and costiveness, which did not yield to the exhibition of various aperients, including croton oil in considerable doses. The pain was not constant nor severe; it was principally felt in turning on the left side, or on taking food or medicine. There was no tension, and but slight soreness of the abdomen. The vomiting was occasional and not alarming: on the third day the matters thrown up had a fecal appearance with offensive smell. On the fourth day, the countenance began to exhibit signs of sinking, and the pulse had become feeble and fluttering. Although, when questioned at an earlier period whether she had a rupture, she had answered in the negative, a ventral hernia, which had existed for twenty years, was discovered on the seventh day, on the left of the umbilicus, and a little below it. The tumour was not tense; pressure upon it gave no pain; it receded under the touch, and passed readily into the abdomen, with a slight gurgling noise, but returned when the pressure was removed. Mr. S. therefore concluded that the symp-

* Page 65.

toms did not depend on the rupture, and that an operation would be useless. The patient, however, became worse and worse, with hiccup, stercoraceous vomiting, and faintings, and the operation was performed on the twelfth day, as affording a feeble chance of recovery. The sac contained two portions of intestine, not strictured; for the finger could be passed easily into the abdomen. One of these was loose and reducible. The other "was so closely united by adhesions to the hernial sac, as to obstruct, to all appearance, its peristaltic action, and prevent the due course of its contents." The adhesions were separated, the intestine was returned, and the patient slowly recovered. It was afterwards found that this patient had long been subject to a complaint in the bowels, and that she frequently experienced so much pain after eating, as to be obliged to leave off work.* These symptoms, and the formidable disorder which had nearly proved fatal, are ascribed by MR. STEPHENS to the adhesion of the intestine.

The other case was that of a very corpulent female, who died after having been ill for several days with pain in the abdomen, vomiting, and obstinate constipation. The symptoms were not urgent at the first, nor regarded as dangerous for some days. She had been previously subject to pain in the bowels after meals. She was not aware that any rupture existed, nor could any swelling be detected on the most careful examination. A slight prominence was, however, noticed near the umbilicus, without any other indications of hernial protrusion. On examination after death, a rupture deeply imbedded in fat and issuing from the navel, was found in the situation of this prominence. It contained a portion of intestine closely adhering to the sac, and doubled upon itself, so as effectually to obstruct its peristaltic action, and the passage of its contents. There was no stricture, nor inflammation of the bowels or peritoneum.†

In the *appendix*, Mr. STEPHENS states that he does not ascribe these injurious effects to all intestinal adhesions, and that it is the *manner* rather than the *extent* of the connexion which is likely to disturb the functions of the canal. The most unfavourable state is the adhesion of a small part of the tube, drawing the intestine out of the regular line of its convolution, and giving it an *angular*

* Page 1—8.

† Page 13—19.

*or acute bent position.** It must be observed, however, that in the several cases quoted from other writers, Mr. STEPHENS does not scruple to ascribe the symptoms to adhesions of whatever form, extent, or position, when he finds them mentioned in the narrative.

We cannot doubt that disorder of the parts contained in a rupture may cause symptoms more or less similar to those of strangulation, without the existence of stricture; and thus that the distinction between obstructed and strangulated hernia is just. We may further admit, as probable, that the confinement of intestine by adhesion might favour the occurrence of obstruction, and thus increase the disturbance. Whether this happens frequently, and whether adhesion alone is a sufficient cause for symptoms closely resembling the effects of strangulation, are questions of fact, which must be determined by an appeal to experience. I have not met with any cases, which would lead me to answer the latter question in the affirmative; while, on the other hand, instances are of daily occurrence, where adhesions exist without the production of such effects.

The practical conclusions, to which Mr. STEPHENS has arrived, are, that the operation ought to be resorted to at an early period in cases of supposed obstruction from adhesions, without regarding the mild character and slow progress of the symptoms, or the soft and indolent state of the tumour; and that all preternatural connexions of the protruded parts ought to be destroyed. On the latter point he goes so far as to contend that in a case, where the cœcum and ascending colon had lain in the scrotum for many years unreduced, the spermatic vessels and testicle being closely connected to the intestine, the latter ought to have been entirely separated and returned into the abdomen.†

Inflamed hernia.—The most embarrassing case, in respect to diagnosis, is where inflammation attacks the contained parts, but is independent of stricture. The unnatural situation of the protruded viscera exposes them to many new causes of disease; and they are liable to the same disturbing influences as in their natural situation. Hence, inflammation of the hernial contents is not a rare occurrence. It is most frequent in large herniæ, especially

* Page 231.

† Page 24—31.

the umbilical: here the swelling is the seat, not the cause of the disease. The disorder soon extends to the abdomen, and causes interruption of the intestinal functions; so that the case is presented to our observation under the same general aspect as that of strangulation. If it terminates fatally, we find general inflammation of the peritoneum. Inflamed is the more likely to be confounded with strangulated hernia, inasmuch as the mischief in both cases begins in the swelling. The first seat of uneasiness, in the latter, is at the neck; in the former, in the body of the sac. The want of tension and of pain at the ring, while the swelling itself is painful, and a previous attack of feverish rigor might lead us to suspect inflammation of the hernial contents. If the ring afterwards became tense, and the included parts considerably painful, we should conclude that strangulation had supervened, and act accordingly.

CHAPTER IV.

Causes, and different Species of Strangulation ; and Prognosis of Strangulated Hernia.

SECTION I.—CAUSES OF STRANGULATION.

THAT the symptoms of strangulated hernia arise from the pressure of the stricture on the protruded parts ; and that this cause is not only adequate to that effect, but, indeed, the only one that can be assigned, is too clear to admit of any doubt. Systematic writers have distinguished the causes of incarceration, as consisting either in a diminished capacity of the opening, or in the intrusion of additional parts into the aperture. This distinction would not be a very important one, if it were well founded, since the presence of either of these circumstances must imply relatively that of the other. I believe, however, that the former can hardly be admitted as a cause of strangulation. The openings through which herniæ generally protrude, being tendinous, cannot contract, or diminish in capacity : hence the term *stricture*, equivalent to contraction or narrowing, is objectionable. The parts are increased in bulk, and the ring feels tense ; hence it is found to be actually *dilated* ; larger indeed than in health. The term stricture has led to erroneous practice, to the use of emollients, and such topical remedies as are supposed to possess the power of relaxing ; whereas we should attempt to reduce the bulk of the parts. The tendinous openings through which herniæ generally protrude, cannot, by their nature, undergo much change ; and particularly do not admit of contraction. The protruded parts, however, are capable of considerable enlargement ; and the tendons can produce passively as complete a constrictive effect as if they had possessed the most unequivocal powers of active contraction. A portion of intestine, or omentum, pushed suddenly by a violent effort through the abdominal ring, may be immediately strangulated. A piece of bowel forced

down in an omental rupture, a new portion protruded in an old intestinal hernia, or the distension of the contained intestine by its contents, whether of food or air, will so fill up the ring as to produce incarceration. In all these cases, the symptoms cease immediately on reduction, or on the division of the ring, which proves clearly the nature of the cause.

It may be a question, whether the stricture produces its injurious effects, that is, the peritoneal inflammation, which supervenes, sooner or later, by direct irritation of the parts included, or more indirectly, by obstructing the intestinal contents. In his very able work,* on injuries of the intestines, which has thrown so much light on all the interesting and important points connected with that subject, my friend Mr. TRAVERS adopts exclusively the latter explanation. In support of this opinion he observes, that the symptoms of strangulated hernia cannot be distinguished from those of mechanical obstruction unconnected with pressure; and that the inflammation is exactly the same with that which follows obstruction of the same canal in ileus. The well-known fact, that simple epiplocele often produces all the symptoms of an incarcerated intestine, and the extremely rapid progress of acute incarceration, as exemplified in the cases mentioned in the next section, compared with the continuance of simple constipation for days and weeks, without causing inflammation, make me hesitate in excluding the stricture on the gut from all share in the mischiefs of incarceration, and ascribing them solely to fecal obstruction. I doubt, too, in the case of enteritis, whether the constipation be not the consequence, and not the cause, of the inflammation. That the sufferings are, in all instances, aggravated by accumulation in the canal above the stricture, and signally relieved when that can be removed; and that, in many cases, intestinal obstruction, slowly advancing, is the sole cause of mischief, will be readily granted. On the other hand, it is equally obvious that the symptoms of strangulation frequently come on with a rapidity, and proceed to a degree of severity, disproportioned to any actual or possible accumulation; and that slight mechanical injury, unattended with fecal obstruction, gives rise sometimes to dangerous and even fatal inflammation. We may expect on this, as on other occasions, that the effect of the local irritation will

* CHAPTER V.

vary according to the condition of the constitution, and of the intestinal functions, in different persons, or in the same individual.

The stricture is most frequently produced by the tendinous aperture; but that sometimes remains loose and free, the pressure being caused by the mouth or neck of the sac. When these are thickened and indurated, as I have described, in the first chapter, SECT. III. they form a firm ring, fibrous and sometimes almost cartilaginous, fully adequate to cause effectual compression on the protruded viscera. The possibility of constriction by the neck of the sac alone is farther illustrated by the observations in the next chapter, on the return of the rupture with the sac; by the facts mentioned in CHAPTER VIII. SECT. II. and by two cases mentioned in the section on the operation for strangulated femoral hernia, in which the parts were returned, still compressed by the neck of the sac.

SCARPA has the following observations on the same subject.—“ In several cases, both of common and congenital inguinal hernia, which I have examined after death, I have found the neck of the sac in such a state that it might easily have caused stricture, while the ring has been so large and flaccid that it could not have opposed any resistance to the increase of the swelling, as in the following case. A man, who had a small inguinal hernia, was seized with severe pain in the belly; then with hiccup, nausea, and vomiting. He used great force in endeavouring to return the parts, and apparently succeeded; but the symptoms increased, and the surgeon, not seeing the cause of the mischief, allowed five or six days to elapse, at the end of which the patient died.* There was found after death, behind the inguinal ring, a small fold of intestine strangulated by the neck of the sac. I have found nothing of this in large and old scrotal ruptures, nor in aged subjects, who had never worn a truss. It has been particularly in patients of middle age, and in scrotal ruptures of moderate size, where bad trusses had been used, that I have found the neck of the sac much constricted, firm in the neighbourhood of the ring, and much more capable of resisting a distending force, than the ring itself. In such cases I have seen the sac, in its passage through the ring, form sometimes a neck or tube, an inch long, sometimes a mere constriction. The part thus contracted

* *Journal complémentaire du Dict. des Sciences med.* Septembre 1818.

has been still farther thickened and strengthened by induration of the surrounding cellular texture, with which the fibres of the cremaster, rigid and sometimes almost coriaceous, have been intimately blended. Introducing the dilator of LE BLANC between the hernial sac and the ring, I found it easy to stretch that aperture, while great resistance was experienced when the instrument was introduced into the neck of the sac itself. I verified the same circumstance in the body of a man who died from an inguinal hernia containing a small portion of intestine: the ring was loose, and yielded readily to distension, while the thickened neck of the sac, which had caused the strangulation, opposed a resistance to the dilating instrument, which could only be overcome by considerable force. The band forming the neck of the sac was four lines broad, and thickened by condensation of the surrounding cellular texture and by the tough and rigid fibres of the cremaster.”*

SCARPA considers that the thickening and contraction of the sac at its neck do not depend merely on the folds into which the membrane is thrown in passing through the ring, and by the pressure of trusses; but that the latter circumstance arises in part from a disposition to contraction in the peritoneum. He says, that when a recent inguinal hernia has been returned and accurately kept up, the neck of the sac not only contracts but closes entirely. This same contraction, consolidating the portion of omentum contained in the neck of the sac, gives to the omental protrusion a pyramidal shape, with the broadest part downwards. In the same way the protruded intestine often shows a manifest impression caused by the gradual contraction of the sac, though without inflammation or other serious symptoms. “I preserve,” he says, “a scrotal hernia of the left side containing colon, the calibre of which at the neck of the sac will hardly admit the middle finger, though the patient, as far as I could learn, had never experienced any symptoms of inflammation or strangulation. In this case the abdominal ring was flaccid and yielding; the neck of the sac, on the contrary, contracted, rigid, and surrounded by a zone of hard coriaceous substance.”†

It is less common to find the cause of stricture in those constrictions of the hernial sac which are found exterior to the ring. Yet such cases are occasionally seen: in-

* *Sull' Ernie*; Mem. ii. § 7.

† *Ibid.* § 8.

stances are mentioned in the chapter on *hernia congenita*. I lately met with a large old entero-epiplocele, towards the bottom of which was a round opening, with a thick hard margin, leading into an inferior division of the sac. The omentum had passed through this, and become firmly adherent; and intestine might have been strangulated in the aperture. SCARPA has met with constriction of the sac in an operation, and on the dead subject.* Further remarks on the same point will be found in CHAP. XI. SECT. II.

It must generally be difficult to determine the seat of stricture, previously to an operation; and no practical advantage could be derived from ascertaining this point. We may observe, however, that when a hernia is incarcerated, at the moment of its formation, there can be no doubt that the pressure is made by the border of the tendinous aperture; and if the patient has never worn a truss, the same observation will probably hold good. When, however, an old rupture, which has been long retained by a truss, is again protruded, and strangulated, the neck of the sac may probably be the cause, in consequence of its having become thickened and contracted by the pressure. Hence arises the danger which a patient incurs by neglecting the use of a truss, after having worn it for some time. SCARPA has observed, that the contraction of the neck of the sac is most common in such cases.†

Some other rare kinds of strangulation have been noticed by surgical authors. It has been produced by preternatural adhesions of the parts;‡ by a fissure in the omentum;§ by the pressure of that part in a hardened state; by various foreign bodies, which had been previously swallowed;|| by worms, &c. None of these causes can be ascertained previously to an operation, or to the patient's death, and are, therefore, of no practical importance.¶

* P. 119, and fig. iv. pl. vi.

† P. 113.

‡ Of the appendix vermiformis; SCARPA, p. 144; LAFAYE, *Acad. de Chirurg.* tom. iii.

§ *Acta Havniensia*, vol. i.; ARNAUD, *Mem. de Chir.* vol. ii.; p. 569, 574, 587. 590.

|| RICHTER, *Tr. des Hernies*, p. 47; MORAND, *Opuscules de Chirurgie*, pt. ii. p. 165; *Acad. des Sciences*, 1728, p. 41.

¶ SCARPA describes minutely various ways in which the omentum has produced strangulation; as by forming a cord fixed to the sac, and going round the intestine; by the intestine passing through a perforation in it; by its forming a mass, adhering to the sac, and pressing on the gut, &c. *Mem.* ii. § 15—20.

SECTION II.—DIFFERENT SPECIES OF STRANGULATION.

AN important distinction arises from the nature and general symptoms of the case; in compliance with which, we discriminate between the acute or inflammatory, and the chronic or slow kinds of strangulation. This, indeed, is highly useful, as it comprehends the characteristic marks of two very different cases, and leads to practical discrimination in their treatment.

The inflammatory strangulation occurs in young and strong patients; in cases, where a rupture is formed suddenly by a great bodily exertion; or where, after having been kept up by a truss for a long time, it is suddenly reproduced by any cause of the same description. It is mostly confined to small herniæ, or to such at least as are of moderate size. Under the circumstances just enumerated, the opening through which the viscera protrude is small; the pressure on the protruded parts must therefore be considerable; and hence, in great measure, arises the peculiar character of the case. The symptoms come on suddenly, and their progress is rapid; the swelling is tense and highly painful, particularly at the ring, where the slightest pressure is intolerable; the abdomen quickly becomes painful, and is tense and elastic to the feel: the constitutional affection partakes of the inflammatory character. So quickly does the complaint run through its stages in this case, that gangrene has been known to occur in less than twenty-four* hours from the expulsion of the intestine.

* WILMER's *Practical Observations on Herniæ*, p. 74; POTT's *Treatise on Ruptures*, in his works, vol. ii. p. 94, edition of 1783. The latter writer mentions another instance, in which a bubonocoele terminated fatally in less than a day. (*Ibid.* p. 85.) Mr. HEY has twice seen patients die of hernia within twenty-four hours. (*Practical Observations*, p. 142.) In a case alluded to by SIR A. COOPER, eight hours only elapsed between the occurrence of strangulation and the patient's death. (*Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*, p. 26.) The same author also gives an instance of umbilical hernia, in which the progress to a fatal termination was remarkably rapid. The symptoms were of the most acute and violent description: death happened in seventeen hours and a half after strangulation began; and the integuments had already mortified at one part of the swelling. (*Anatomy and Surgical Treatment of Crural and Umbilical Hernia*, p. 45.)

A soldier, fatigued by forced marches in Egypt, had a hernia formed and strangulated immediately; he was brought to the "ambulance" instantly, and perished in two hours with gangrene of the part, and of the abdominal viscera. LARREY's *Mem. de Chirurg. Milit.* tom. i. p. 196. The second instance he has known of such a rapid progress.

“ A stout young butcher, of sanguine temperament, twenty-eight years old, had a bubonocoele of the size of the fist, formed suddenly in an attempt to lift half an ox. Violent pain came on immediately, and obliged him to go to bed; vomiting and hiccup followed. He was bled largely, and sent to the Hotel Dieu. The ring was quite hard, (*dur comme du fer*,) the swelling and whole abdomen so acutely sensible, that attempts at reduction were out of the question. The mind was already affected by the intenseness of the pain; face flushed, pulse hard and tense, and breathing hurried. The operation, performed ten hours after the accident, gave a momentary relief; but the hiccup continued, the pulse became thready, and the abdomen inflated. In eleven hours after the operation, his sufferings were ended by death. Redness and agglutination of all the intestinal convolutions, without any effusion of fluid, and gangrene of the parts, which had been protruded, were the appearances observed on examination of the body.*

In the course of last year, I operated on a young butcher in St. BARTHOLOMEW'S Hospital for scrotal hernia, within eight hours from the descent of the parts. The symptoms were so urgent, as not to admit of delay. The swelling was tense, hard, and extremely sensitive; the pain so severe, that the patient rolled about in bed, and could with difficulty be kept quiet during the operation; the countenance expressive of great distress and anxiety. The swelling contained several convolutions of small intestine, which escaped as soon as the sac was divided, curling over and covering the scrotum on both sides. The bowel was of a dark livid hue, and marked with a deep impression where it had been subjected to stricture. He had been largely bled on admission into the hospital, and a considerable quantity of blood was again drawn from the arm soon after the operation. He recovered rapidly.

The slow strangulation takes place in large and old herniæ, which have been often protruded and replaced, or which have been long unreduced. The contained intestines, removed from their natural situation, and no longer supported by the pressure of the respiratory muscles, are probably rendered somewhat indolent in performing their functions; as patients of this kind are habitually subject

* PELLETTAN, *Clinique chirurg.* tom. iii. p. 364.

to costiveness and intestinal complaints. The contents of the alimentary canal will be easily retained in a situation where they enter the intestine without difficulty, but have their egress obstructed by the force of gravity. The entrance of indigested food, of worms, or of a foreign body, into such a tumour, would be likely to cause irritation and obstruction, and consequent accumulation of the intestinal contents. The strangulation arising from such an accumulation, constitutes the case, which has been termed by a French writer * “*hernie par engouement des matières.*” The rupture swells slowly, and becomes heavy and hard. The patient is constipated. The abdomen enlarges from the accumulation of the intestinal contents above the stricture. After some days, the swelling becomes painful, and the patient grows feverish; but the fever is not considerable, neither is the abdomen or tumour ever so painful and tense as in the former species of incarceration. In some cases of this description, a fortnight has elapsed without any considerable morbid alteration having taken place in the protruded parts. LE DRAN† operated on the sixteenth day without finding the contents of the swelling much altered from their natural appearance; and SAVIARD‡ did the operation with complete success on the twenty-second day from the commencement of the incarceration.

The unusual heaviness and hardness of the tumour, the constipation preceding the pain, and the slow origin and progress of the symptoms, are the peculiar characters of this strangulation. The indication is to unload the intestine. The inflammation, which occurs in the sequel, is a secondary symptom.

The differences, observable in the two very opposite cases just described, admit of easy explanation. In the first, the close pressure of the ring on the prolapsed parts, in a subject prone to inflammation, quickly brings on violent inflammatory derangement of the peritoneum or intestines. The impeded action of the bowels, on the other hand, where the parts and the constitution are less easily excited, gives to the disorder the character of mechanical obstruction. The former is *strangulated*, the latter *obstructed*, hernia.

* See a Memoir of M. GOURSAUD, “*Sur la différence des causes de l'étranglement des hernies,*” in the *Mém. de l'Acad. de Chirurg.* tom. iv.

† *Observations de chirurg*; Obs. lvii.

‡ *Nouveau Recueil d'Obs. Chirurg.* Obs. xx. p. 112.

As the description is drawn from the most strongly marked cases, we shall seldom find the difference between the two kinds of affection so clearly expressed. The symptoms indeed are often of such a mixed and indefinite nature, that they might be arranged without impropriety under either of the above species.

The state of a rupture in *chronic strangulation*, is the same as that described in the last section under the denomination of *obstructed hernia* ; in many cases of which, it is doubtful whether the protruded parts experience any effective pressure, and whether, therefore, stricture has any share in producing the symptoms. That it is not the primary cause seems tolerably clear.

The distinction that has been drawn by SCARPA, SIR CHARLES BELL, and others, between *incarceration* and *strangulation*, two terms which have generally been employed indifferently to denote the same state of a rupture without regard to their difference in etymological import, is equivalent to that of acute and chronic strangulation, or of strangulated and obstructed hernia. “ The intestine,” says SIR C. BELL, “ is retained in the sac by *incarceration*, that is, in consequence of its distention ; but there is no stricture on the blood-vessels of the intestine : it is *strangulated*, which is that state, when not only the alimentary matter is obstructed in the canal, but when the blood in the vessels is also obstructed, and there is momentary danger of mortification.”* He observes further, that the protruded portion of the bowel becomes distended by its own secretions ; thus it is augmented in bulk, and consequently more confined by the stricture, and in imminent danger of strangulation. “ As the included portion of intestine became filled, (in a femoral rupture,) the angle of reflection formed over the sharp edge of the stricture increasing every hour, the coats became so tightly drawn against the edge of the stricture, that they were first gorged with stagnant blood, and finally, the circulation was stopped. *Strangulation* then took place, and *mortification*, or the *ulceration* of the intestine by pressure against the tendon.”† We are often unable to distinguish between mere obstruction or incarceration, and strangulation ; neither the local nor the general symptoms affording, in many instances, any indications on which such a diagnosis can be grounded. Even strangulation, in the sense properly affixed to it by

* *Surgical Observations* ; vol. i. p. 179.

† *Ibid.* p. 185.

SIR C. BELL, may proceed to mortification without characteristic change of symptoms. If the discrimination were easy, it would be of practical importance; since the operation, which is the only means of relief in strangulation, is not so urgently required in the obstructed state of a rupture. Our treatment, however, is nearly the same in all cases: we employ certain modes of relief, and, if they fail, we proceed to operation, whether the case should wear the aspect of strangulation or of simple incarceration.

To the two kinds of strangulation which I have now described, RICHTER has added a third, under the epithet of *spasmodic*, which he considers to arise from the action of the external oblique muscle. It does not seem to me that this case is sufficiently characterised, nor that any practical benefit can be derived from the distinction. The following passage will show what symptoms this author considers as peculiarly denoting the existence of spasm:—

“La respiration courte et froide, le ventre tendu, gonflé, et cependant peu douloureux, le froid, et la pâleur de la mort, qu’on remarque au visage, aux extrémités; l’anxiété, l’agitation, le vomissement, le hocquet, le pouls petit et serré ne sont-ils pas des preuves manifestes d’une maladie spasmodique? et ces symptômes paroissent souvent dans les premiers momens de l’étranglement.” *

If these are the symptoms of a spasmodic stricture, every rupture which happens may be classed under this description.

RICHTER considers further, that the remissions and exacerbations observable in some cases, the benefit derived from opium, warm-bathing, and other means of the antispasmodic kind, the cases in which examination after death has discovered no signs of inflammation in the protruded parts, and the absence of the circumstances characterising the other species of incarceration, are strong arguments for the spasmodic nature of the symptoms. He admits, that inflammation will ultimately supervene; and consequently, that those cases, which might at first have been relieved merely by antispasmodics, require, in the latter stage, the antiphlogistic treatment. It appears, that the remarks of this excellent surgeon refer rather to a particular stage of the complaint, or to the characters which it assumes in particular constitutions, than to any essential

* *Traité des Hernies*, p. 53.

distinction in the nature of the affection. We shall allow, without difficulty, that the first symptoms of strangulation do not proceed from actual inflammation of the bowels, but from irritation affecting these organs : since the replacement of the rupture will produce instant relief. It may be expected, too, that in certain irritable constitutions, this character of the symptoms will be more obvious. Opium will undoubtedly appease the symptoms, and procure temporary relief ; but the cause still remains ; and the progress of the case will speedily exhibit inflammation. I do not therefore see a sufficient ground for establishing this distinction, and I think it might even prove injurious, by encouraging an inert treatment in an affection where delay is highly dangerous.

SECTION III.—PROGNOSIS OF STRANGULATED HERNIA.

IN a case of strangulated hernia, our prognosis will be influenced by the cause of the rupture, by the nature of the strangulation, by the size, situation, and contents of the swelling, and by the age and constitution of the patient.

The pressure on the prolapsed parts will be in proportion to the narrowness and unyielding nature of the tendinous opening : the progress of the symptoms, the urgency of the danger, and the necessity of employing means of relief, will be increased in the same ratio. They proceed more slowly in proportion to the largeness of the opening and the weakness of its margins.

A large and old rupture, which seems most formidable on the first view, is in reality attended with less danger than a small and recent one ; and it is more difficult to effect the replacement of the latter than of the former kind.

“ I think,” says MR. HEY, “ it is not a bad general rule, that the smaller the hernia, the less hope there is of reducing it by the taxis. Long continued efforts to reduce a prolapsed intestine are most likely to succeed in old and large hernias, when no adhesion has taken place.”*

An old rupture is not readily strangulated, and when it

* *Practical Obs.* p. 203.

falls into this state, the danger is not imminent ; the distention of the opening, previous to incarceration, has so dilated and weakened the parts, that they can no longer produce a close constriction. In a small and recent case, the dimensions of the aperture are unimpaired, and its sides are unyielding : strangulation takes place easily, and the degree of stricture is always considerable.

The danger is greatest when a rupture is incarcerated at the moment of its formation. *Herniæ*, which arise spontaneously, and, as it seems, merely from predisposing weakness, seldom become strangulated : the stricture, in such cases, is never close, nor are the symptoms violent, because the parts concerned are weak and relaxed.

The opening, through which the parts protrude, is narrower in some situations than in others ; the progress of the case will therefore be more rapid, and the danger of the patient more urgent. The aperture is generally very small in femoral hernia : this kind of rupture in men, and the bubonocoele in women, have a particularly narrow entrance. On the same grounds, femoral, inguinal, and umbilical ruptures are more dangerous than the ventral, perineal, or vaginal kinds.

An enterocele is more hazardous to the patient than an omental rupture ; for the parts are more sensible, and the due performance of their functions is more essential to the support of life.

The strangulation of a small portion of intestine is the most dangerous, because the opening is narrow, and presses closely, while the whole effect of the pressure is felt by the undefended gut ; consequently inflammation appears speedily. When the quantity of intestine is greater, the ring must be more open, and there is a portion of mesentery to partake of the pressure. The omentum protects the intestine more or less in an entero-epiplocele. An incarcerated epiplocele is the least dangerous, and, indeed, is seldom fatal. The sensibility of the omentum is not considerable in the natural state ; it can bear much pressure without inconvenience ; and it does not ordinarily excite alarming symptoms when inflamed.

In persons of a robust constitution, and of the adult period of life, the symptoms will partake of the inflammatory character ; the ruptures of old subjects are generally of long standing, which, together with the diminished powers of their system, bestows on the complaint a more languid

form. It assumes the same appearance in individuals of a weak frame. The herniæ of very young subjects are attended with less danger than those at a more advanced age, from their organs being more yielding, and because they are less susceptible of acute inflammation. Yet, although they are rarely strangulated, they are not entirely exempt from this occurrence. Mr. POTT* saw a child of one year old die of incarcerated rupture. GOOCH† has recorded an instance, which proceeded even to mortification, in an infant of ten weeks; and one of six months perished from strangulation, in the hospital at Leyden.‡

CASE.—I witnessed a successful operation for scrotal hernia, at ST. BARTHOLOMEW'S Hospital, in a child fourteen months of age. This case, which was under the care of Mr. LONG, afforded an exception to the general rule mentioned by Mr. POTT,§ “that all those ruptures, which appear in the scrotum of very young children, are congenial.” The parts had descended to the bottom of the scrotum, but were not contained in the tunica vaginalis testis. All the usual means of reduction had been attempted ineffectually, before the operation was resorted to; the tumour contained a portion of large intestine; the sac was thin, and, though adherent to the surrounding parts, mistaken at first, as it frequently is, for the intestine: the closeness of the stricture rendered the division of the tendon a matter of some difficulty. The crying of the child forced the gut frequently through the wound in the progress of the cure: but the parts being supported by sticking-plaster, gradually healed. The rupture descended again in a short time.

The operation for strangulated scrotal hernia, not congenital, was performed the summer before last by Mr. STANLEY at ST. BARTHOLOMEW'S Hospital, on an infant of seven months. Peritoneal inflammation followed, for which six leeches were twice applied. The child recovered rapidly.

* *Works*, vol. ii. p. 33.

† *Surgery*, vol. ii. p. 203. It appears that this case must have suffered strangulation for twenty days before the gut gave way; but at first the fæces were not entirely suppressed. They were afterwards discharged through two openings, which soon healed, and a complete recovery followed. Probably the cœcum had been protruded: but it is not stated on which side the complaint was situated.

‡ GERARD SANDIFORT, *Tabulæ Anatomicae*; see *Edinb. Journal*, vol. iii. p. 470.

§ *Works*, vol. ii. p. 23, note,

M. DUPUYTREN operated on a congenital enterocele, in an infant twenty days old. It is stated that the child had several abundant stools before and during the operation. Great difficulty was experienced in reducing the bowel, and retaining it in its place. The event of the case is not mentioned.

M. GOYRAND, of Aix, has published the two following cases, in which he found it necessary to operate on infants for scrotal hernia.

CASE I.—An infant of four months old, the son of Mr. CARBONEL, professor in the College of Aix, had been affected for ten days with scrotal hernia of the right side, which became irreducible on the 26th of April, 1833. Vomiting came on immediately. When I saw the little patient at the end of the third day, I found a hard painful tumour as large as a pigeon's egg; the testicle was included in it. The abdomen was distended, with irregularities marking the convolutions of the small intestine. Constipation had existed from the commencement of the symptoms. The child cried incessantly, refused the breast, and vomited fecal matter. The operation was performed on the 30th. The sac contained a little serous fluid and a convolution of small intestine of brownish red colour. The testicle, uncovered, was placed at the lower and back part of the sac. The strangulation had been caused by the neck of the tunica vaginalis a few lines above the tendon of the obliquus externus. I divided the latter, and then cut through the strictured neck of the sac upwards and outwards, with a narrow bistoury blunt at the end, guided by a grooved director. The replacement of the intestine was attended with some difficulty from the struggles of the patient; and it was necessary, in order to keep the parts up, to cover the opening with a pad of linen secured by the spica bandage. The bowels were freely relieved in the course of the same day; and the child, having slept well, had recovered its looks on the following day, when it took the breast greedily. Nothing occurred to interfere with the curative process, which was complete on the 15th of May. The rupture reappeared in two months. The child, now four years old, is perfectly well; the rupture being kept up by an elastic truss.

CASE II.—In August 1831, I saw at the Foundling Hos-

* *London Medical Gazette*; vol. i. p. 576.

pital an infant of six months with a scrotal hernia, which had been irreducible for eight days, and attended with constipation and vomiting. The left side of the scrotum was occupied by a hard oval tumour proceeding from the ring; the testicle was free below the swelling. The sac contained the sigmoid flexure, of its natural colour, and distended with hard feces. It was necessary to enlarge the ring freely, in order to push back the contents of the bowel, which could only be accomplished gradually. When the intestine had been thus emptied, it was easily returned. The bowels were immediately relieved; a large quantity of solid fecal matter coming first, and then abundant liquid stools. The vomiting ceased, but diarrhœa ensued, which nothing could arrest, and the patient sank in forty-eight hours.*

* *La Presse médicale* ; March, 1837.

CHAPTER V.

Treatment of Reducible Ruptures.

THE treatment of a reducible rupture comprehends the return of the protruded parts, and their retention within the abdominal cavity by means of an appropriate truss. If this should produce contraction of the sac and ring, or agglutination of the sides of the former, and thus prevent renewal of the protrusion, the cure is complete, or radical; it is palliative, or incomplete, if the patient be obliged to wear the truss permanently during the remainder of his life.

So long as the protruded viscera can be made to pass freely into the abdomen, this complaint is attended with no immediate danger to the patient. It may, indeed, be troublesome, both from the bulk of the swelling, and from the intestinal derangements, which the residence of the viscera in their unnatural situation is apt to create; but, independently of these circumstances, it may exist throughout life, without causing more than slight inconvenience. This harmless state of the disorder cannot, however, be depended on; as numerous accidental causes may, at any time, bring it into a condition, in which the life of the patient is exposed to the greatest risk. A trifling bodily exertion, by forcing down an additional quantity of the bowels, excess in eating or drinking, indigestion, or any intestinal disorder, may convert the rupture from a reducible to an incarcerated state. Should the patient escape this fate, the unrestrained increase of the swelling constitutes a sure source of future inconvenience and disease. The vast size, to which neglected herniæ sometimes increase, not only prohibits all active exertion, but, by involving, in the male, the integuments of the penis, incapacitates the subject from the act of copulation, and gives rise to excoria-

tion from the discharge of the urine over the swelling.* Probably, too, the testis may be affected by the pressure of a very large scrotal hernia.† Disorders of the intestinal functions invariably attend these large ruptures, and increase in frequency and violence, in proportion to the size of the swelling and the age of the patient. All the moveable viscera of the abdomen gradually find their way into the hernial sac, if a rupture be neglected. Numerous instances are recorded, in which the jejunum, ileum, colon, and omentum, have been entirely included. The constant force acts even upon the more fixed parts, and entirely changes their relative positions; thus the stomach is brought into a perpendicular line parallel to the axis of the body; and its pyloric orifice has been actually within the mouth of the sac. It was drawn down to the pubes in the case of Mr. GIBBON,‡ in whom the hernial sac nearly reached the knees, and contained, with the omentum, all the intestinal canal except the duodenum and cœcum, its mouth being large enough to receive the hand.

SIR ASTLEY COOPER saw a scrotal hernia, which reached to the patient's knees; the length of the swelling being twenty-two inches, and its circumference thirty-two. It became strangulated, when the latter measurement was increased to thirty-four inches.§

In an enormous scrotal hernia, of which the description was communicated to the French Royal Academy of Medicine by Mr. YVAN, a large part of the stomach itself was contained. The patient was an invalid soldier, affected some years before his death with an inguinal hernia, which could be replaced but not retained, although various trusses were tried: a suspending bandage was therefore employed, its size being gradually increased. Vomiting came on which nothing could arrest, although there was

* See the account quoted from FREYTAG, towards the end of Chap. VI. of the great size which the ruptures of the Swiss peasantry attain, in consequence of their being almost entirely unprovided with proper means of restraint, and of the dreadful inconvenience and sufferings which they occasion.

† MORGAGNI *de Caus. et. sed. ep. xxxiii. art. xii.*; SCHMUCKER *Vermischte Chir. Schriften*, B. iii. p. 195.

‡ *Miscellaneous Works*, by Lord SHEFFIELD, 4to, vol. i. p. 229. Sir A. COOPER, *The Anatomy and Surgical Treatment of Abdominal Hernia*; part i. p. 25, Ed. 2. See also MERY in the *Acad. des Sc.* 1701; CARLISLE in *Phil. Trans.* 1766. No. 18.

§ *Ibid.* p. 13.

no strangulation, and in a month the patient died. The ring was enlarged to eighteen inches in circumference. The hernia contained the lower third of the stomach, the great omentum, and the large and small intestine, except the cœcum, the sigmoid flexure, and the rectum. The stomach was parallel in its position to the axis of the body, enormously distended, and divided by a circular depression into two portions, a superior situated in the abdomen, and an inferior contained in the rupture. The length of its great curvature was three feet, of the less, eighteen inches; the circumference at the largest part twenty inches, at the circular depression seventeen inches. It contained five litres of liquid. Mr. YVAN presented the stomach to the Academy.*

A man, 60 years of age, labouring under a double inguinal hernia, consulted DR. MONRO secundus. "That of the right side reached four inches below the knee, and was not less than two and a half feet in circumference. From the under abdominal aperture, for the space of eight inches, the tumour felt hard, and the under part of the tumour contained a watery fluid. The hernia of the left side contained intestine, which was much stretched with air, and was about nine inches long and six in diameter."†

The foregoing considerations should render every person afflicted with a rupture, anxious to get the parts replaced, and to have a proper truss applied; and they should lead surgeons to inculcate the necessity of these measures, as forcibly as they can, on the minds of all such as seek relief from their advice.

SECTION I.—THE TAXIS.

IN the *return*, *replacement*, or *reduction* of a rupture, the parts go back in a direction contrary to that of their descent, and resume their normal situation. As the protrusion occurs sometimes suddenly, sometimes slowly, analogous differences are observed in the return or reduction of the displaced viscera, which may take place at once and quickly, or gradually and insensibly. Sometimes, espe-

* *Archives générales de Médecine*; tom. xxii. p. 139.

† DR. MONRO, (tertius,) *Morbid Anatomy of the Human Gullet*, p. 459.

cially when the rupture is of moderate size, and contains intestine only, it passes up spontaneously when the patient lies down, or is exposed to cold ; but pressure is necessary in many cases. The methodical employment of such pressure, which the surgeon usually attempts in the first instance when his assistance is required in a case of hernia, is technically called the *Taxis*. In this surgical proceeding, we act in opposition to the causes which have produced the complaint ; viz. the pressure exerted by the muscular parietes of the abdomen, and the gravitation of the viscera ; our object is, to suspend the action of those causes, or to overcome them. The latter point can sometimes be accomplished by applying pressure while the patient is standing ; but the replacement is often more difficult, requiring a particular position of the patient's body, with attention to other circumstances, and the exercise of stronger and more methodical compression.

The abdominal muscles should be relaxed, that they may not resist the replacement of the viscera ; and the rupture should be made the highest point of the abdomen, that the return of the parts, and the removal of the other viscera from the neighbourhood of the ring, may be favoured by gravity. Hence the patient should be in the recumbent posture, the head being supported by a pillow, and the pelvis raised higher than the shoulders. If the latter be slightly elevated by the pillow under the head, the trunk will be curved, and the abdominal muscles completely relaxed. The pelvis may be raised a little on the side of the rupture. If the latter be of the inguinal or crural kind, the hips and knees should be bent, and the soles of the feet should rest flat on the bed. The thigh of the affected side should be rolled inwards, so as to relax the fascia of the limb and the aponeurosis of the obliquus externus.

The bladder should be previously emptied ; and the alimentary canal ought also to be cleared, if the experience of former attempts, or any other circumstances, should lead us to expect difficulty. The patient should abstain from coughing, holding his breath, or any similar efforts ; and he ought not to raise his head, as he is naturally inclined to do, for the purpose of observing the proceedings.

Since the position now described is the most favourable to the return of the protruded parts, it should be continued, as nearly as circumstances will admit, until the rupture is replaced. These precautions procure as much room as

possible in the abdominal cavity, and assist the reduction, as far as that object can be effected, by the force of gravity.

When things are thus prepared, the surgeon places himself on the ruptured side of the patient, and in a situation which he can occupy without inconvenience for some time, since he has occasion frequently to persist for as much as an hour before he gives up the attempt: and it often happens, that by perseverance in trying various positions and modes of pressure, herniæ are ultimately replaced, which did not yield at all to the first efforts.

We begin with a gentle uniform pressure on the tumour, gradually increasing it, subjecting the whole surface, as well as we can, to the compression, and directing the protruded parts towards the mouth of the sac. It is not necessary, in general, to carry the pressure to such an extent as to cause pain; but we cannot always accomplish our purpose without this unpleasant attendant. Continued moderate force will generally accomplish the point better than violence, which presses the parts in a mass against the tendinous aperture, with risk of bruising and injuring them, and thus exposing the patient to new dangers.

The tumour may be grasped with one hand, while the other is placed at the aperture, where it may be employed in preventing the parts from being pushed over the edge of the ring, in facilitating their entrance, and in keeping up those, which have been already returned. In large ruptures both hands must be employed to subject the entire tumour to the pressure. This method is strongly recommended by PETIT*.

The pressure should be exerted according to the direction in which the protrusion has taken place; that is, directly backwards, or perpendicularly to the surface of the abdomen in umbilical or ventral ruptures; upwards and outwards in the common external inguinal hernia; first backwards, and then upwards and inwards, in femoral herniæ. We should examine into the situation of the mouth of the sac in each case, and direct our pressure accordingly. However, when we have failed in one direction we must try others; and we may sometimes be assisted by a knowledge of the attitude and circumstances, which the patient finds most conducive to reduction.

* *Tr. des Mal. Chir.* tom. ii. p. 323—328.

The following manœuvre will sometimes succeed in bubonocoele or scrotal hernia, after the more ordinary methods have failed, particularly when the difficulty seems to be caused by an accumulation of fecal matter. Let the surgeon embrace the neck of the swelling, close to the tendon, with the finger and thumb of one hand, and carry them downwards with a moderate pressure, so as to remove the contents from the portion next to the ring; this will reduce the size of that part, which he may then attempt to pass into the ring. Indeed, since the obstacle exists at the mouth of the sac, reduction will in general be more easily effected in large ruptures, by pressing the upper part of the tumour towards the ring, than by exerting general pressure over the whole swelling.

If the efforts at reduction, managed according to the above directions, are not attended with success, the following method has been recommended. A strong man, placed in a convenient position near the edge of the bed, supports the lower extremities on his shoulders, so that the patient's head and chest only rest on the bed. Attempts at reduction in this posture are said to have succeeded after everything else had failed, and have therefore been highly recommended by some surgeons. I cannot fairly appreciate the merits of this proposal, as I have never adopted the practice, nor seen it employed by others. It does not seem to me to promise any advantages that could compensate for the unpleasantness, trouble, and inconvenience inseparably connected with its employment. The proposer of this manœuvre must have expected to accomplish reduction by the mechanical effect, which the weight and dragging of the viscera in the abdomen would have on the protruded parts. That there is little ground for such an expectation must be immediately perceived by any one, who forms a just notion of the natural state of the parts; who is aware that the abdomen is accurately full, and that all its contents are preserved in their relative positions by the pressure of the respiratory muscles; that they cannot therefore fall from one part of the cavity to another, but are probably nearly in the same place, whether the head or the heels be the most elevated point of the body. Reduction is opposed by the pressure which the protruded parts experience, and this position can neither overcome nor diminish that obstacle.

“This posture,” says SIR A. COOPER, “does not provide for that relaxation of the abdominal muscles which is so desirable, and it is altogether painful to the patient, and

renders it difficult for the surgeon to apply proper pressure upon the tumour. From frequent experience of it by my own trials, and by witnessing those of others, I can affirm that I have never found it answer, where the other method, fairly and fully performed, had previously failed.”*

If the taxis should not succeed at first, it may often be successfully repeated after the use of the warm bath, bleeding, or cold applications, aided by rest in the horizontal position.

The possibility of returning a hernia, and the ease or difficulty with which the object is accomplished, will depend on various circumstances. Ruptures of moderate size are most easily replaced; the small and the large are more difficultly managed. In the small, the tendinous opening or the mouth of the sac is narrow, and consequently presses closely on the protruded parts: hence the difficulty of returning crural herniæ. The same remark is applicable to those suddenly produced, and to such as, after having been long kept up by a truss, come down again from any sudden cause.

If the swelling contains a considerable portion of the viscera, which have been long out of their natural situation, the abdominal cavity becomes accommodated to the diminished bulk of its contents; its capacity is lessened, and it resists the return of the protruded parts. Their presence, if we succeed in forcing them back, may be a source of uneasiness, or even cause so much pain, that we are obliged to allow them to come out again.

When the mouth of the sac and the tendinous ring are large, the body of the swelling smaller or not larger than the neck, the parts, if unadherent, go in most easily and at once; it is sufficient to elevate the swelling, and to press it gently. The viscera descend again with equal readiness: such ruptures come down in the vertical, and pass up of themselves in the horizontal position. A contracted mouth of the sac constitutes an obstacle to reduction, preventing the parts from going up suddenly: the replacement, which requires a continued application of pressure, is effected gradually and successively, and the protrusion is not easily reproduced.

In the case of a globular or flattened tumour, there is greater difficulty than with one of an elongated or pyriform shape. The parts, which slip easily along the inclined

* Part i. p. 32, ed. 2.

surface of the latter, towards its mouth, are pressed in a mass against the orifice of the sac and its circumference in the former, so that part of the force is lost. This may be sometimes remedied by grasping the tumour and drawing it outwards, so as to elongate it, and bring it into a shape more nearly approaching the conical.

Inequalities of bulk in the protruded parts may cause difficulty and irregularity in the reduction.

The return of intestine will be more or less impeded if its volume is increased by distention with solid or liquid matters, or with air; thus difficulties frequently arise from eating heartily, from indigestion, costiveness, and flatulence. If we can press back the contents into the abdomen, the bowel goes up immediately afterwards, and reduction is generally accomplished with ease. Fluid and gaseous matters go up readily; it is not so easy to get rid of solid feces. The gurgling sound depends on the presence of air, and its passage through the intestinal contents: it will vary in degree according to the quantity of air, the more or less fluid state of the alimentary matters, and the dimensions of the mouth of the sac. If the latter is large, there may be no distinguishable sound. The return of fluids takes place insensibly, or communicates a slight sensation to the hand. The replacement of a rupture may be prevented by the hardness of the fecal matters.

The return of intestine is frequently, but not necessarily, preceded or accompanied by the peculiar sound caused by the passage of air through the strictured part. The bowel at first recedes gradually; then, escaping from under the fingers, slips in suddenly: sometimes it goes up all at once. The omentum passes slowly to the very last portion, which must be actually pushed through the opening. If, however, the intestine should be empty, it may pass up gradually; while omentum, which has become firm and of a rounded form, may slip in suddenly. Thus we are often unable to determine, by the sensation communicated to the hands, and by the mode of return, whether the rupture be intestinal or omental. Nor can we always decide whether the swelling contains omentum or intestine simply, or both parts; in the latter case, the intestine and omentum may go up successively, or together.

The intestine and omentum are constricted by the pressure of the sac, at its mouth, in ruptures which have been long unreduced; they appear as if they had been firmly

tied, swelling out below the contracted portion; and this effect remains after the cause of constriction has been removed. Such a state of parts must oppose a more or less serious obstacle to reduction.

Adhesions may prevent the return of the hernial contents entirely or partially.

If the parts adhere together, without being connected to the sac, and if they form a mass disproportioned to its orifice, reduction will be prevented.

Frequently the intestine is unadherent, and capable of replacement, the omentum adherent. This state of things is often attended with serious inconvenience. The presence of the omentum prevents the use of a truss, and keeps the mouth of the sac open, so that a portion of intestine slips out easily; this addition to the contents of the rupture being sometimes attended with so much pain and inconvenience, that patients have submitted to the operation to obtain permanent relief.

When the adhesion is partial, the unadherent portion may be returned; as we continue to press on the parts, they drag the sac upwards: but the replacement cannot be completely effected, unless the uniting bands should be long and loose, or confined to some point of the mouth or neck of the sac, or unless some inversion of the sac should take place. If the protruded viscera adhere to the whole circumference of the neck, they cannot be pushed back: should there be only a small convolution of intestine, pressure might cause a partial invagination of the bowel and apparent return. The protrusion will be quickly reproduced; and the same result may be expected when the parts, although returned, are still adherent to the sac. These circumstances explain a difficulty occasionally met with; namely, that although we can return a rupture, we cannot keep it up.

If the protruded viscera adhere to the fundus of the sac only, by bands of some length, they may drag it up, and even invert it, if it is loosely connected to the surrounding parts. M. J. CLOQUET found, after death, "the sac of an internal inguinal hernia returned into the abdomen, and resembling the finger of a glove, the apex, which had been the fundus of the sac, adhering to a portion of omentum, which seemed to have dragged it up."*

He says, that he has frequently produced in the dead

* *Recherches*, p. 102, note.

body this effect, which he calls reduction by *inversion* of the sac, in the case of empty sacs not adhering strongly to the surrounding parts, especially when the neighbouring cellular tissue was infiltrated. Sometimes, in such trials, the sac is returned without inversion; the neck gives way to the pressure and is pushed in so as to form a prominence, with an opening in the centre, on the internal surface of the abdomen.* He adds that the reduction by inversion can be effected more particularly in crural and internal inguinal herniæ. It is more difficult and in general impracticable in external inguinal ruptures, from the connexion of the sac to the spermatic cord and the round ligament of the uterus; or, if it is apparently accomplished in this case, the return is found to be incomplete, as the cord descends again and carries the sac with it.†

In the kind of reduction now under consideration the peritoneal sac only is pushed back; sometimes, however, the other coverings follow it, and even the integuments may be drawn in, so as to exhibit a hollow externally. M. CLOQUET saw in the dead body an internal inguinal hernia of the left side, where the skin, adhering to the other coverings of the swelling, had followed them; so that when the subject was laid horizontally on the back, there was a large depression, ten lines in depth, corresponding to the inguinal ring. When the trunk was raised into the vertical position, the viscera again fell down into the sac, so that this excavation was effaced, and its place supplied by a tumour.‡ In many cases, especially where the ring is large, we can partially invert the sac and its coverings during life: that is, we can carry the finger into the ring, pushing the integuments and sac before it. Thus we can not only determine the size and strength of the tendinous aperture, but we may also sometimes feel the epigastric artery in bubonocele. "In many cases of inguinal hernia," says M. CLOQUET, "I have tried this experiment with success, and have been able, by feeling the pulsations of the epigastric artery, to determine the position of the vessel. At the consultation of Professor DUBOIS I saw a young girl with an umbilical hernia, of which the coverings could be pushed

* This kind of inversion, which is usually partial, is exemplified in cases at pp. 105, 106, and 107; Pl. viii. fig. 6, 1, and 3: a specimen of complete inversion is seen at p. 104; Pl. viii. fig. 2.

† *Recherches*; p. 104—107.

‡ *Ibid.* p. 108.

into the abdomen, forming a cavity that would hold the finger.”*

REDUCTION OF HERNIAL TUMOURS IN A MASS.

If the viscera are closely embraced by a thickened and indurated ring at the mouth of the sac, not firmly connected to the tendinous aperture; if the sac itself is loosely attached to the surrounding parts, and more especially if the contents adhere to each other and to the sac, the rupture may be pushed back into the abdomen in a mass, sac and all together, and will form a tumour between the peritoneum and the abdominal parietes. This, which the French call *reduction en bloc*, seems to have been first noticed by LE DRAN,† who, in a case of femoral rupture, found on dissection the sac pushed through the tendinous opening with its contents, and still firmly including them.

DE LA FAYE‡ and ARNAUD§ confirm the statement of LE DRAN by their own experience. The difficulty of accounting for such an occurrence, when the universal adhesion of the sac to the surrounding parts is considered, and the still greater difficulty of allowing that a large tumour (for it was of considerable size in the case related by LE DRAN) could be thrust under the crural arch, led Mr. LOUIS|| to consider the whole affair as fabulous. RICHTER has espoused the defence of LE DRAN with considerable warmth, both in a separate publication,¶ and in his work on ruptures.

M. J. CLOQUET has paid considerable attention to this subject, which he has carefully investigated by numerous trials on the reduction of ruptures in the dead body. He says that “when the aponeurotic opening is tolerably free, and the neck of the sac does not adhere to it strongly, the cellular connexions between them may give way to the force employed for the purpose of returning the rupture, and thus the sac and the tendinous ring may become separated. The former is gradually pushed through the latter,

* *Recherches*, p. 108, note.

† *Obs.* 58.

‡ *Opérations de DIONIS*; edit. v. p. 324; note A.

§ *Traité des hernies*; tom. i. p. 96.

|| *Mém. de l'Académie de chirurgie*; tom. iv. p. 299.

¶ *Programma, in quo demonstratur herniam incarceratam una cum sacco suo reponi per annulum abdominalem posse contra chirurgum Gallum clar. LOUIS.*

dilating it in its passage ; at last it slips up suddenly, and is placed behind the opening. It can now be felt through the abdominal parietes, forming a firm, rounded tumour, deeply seated in the situation of the ring. Here the reduction is complete : the hernia has passed up in a mass, and is placed between the peritoneum and the abdominal parietes. The ring contracts after the tumour has passed through it, and thus prevents, to a certain degree, the re-appearance of the protrusion. The sudden passage of the fundus of the sac through the ring, in this kind of reduction, is sometimes attended with a slight impulse, which is not felt when the ring is lax and large, as I have observed several times, and particularly in two small internal inguinal herniæ : in the latter case the tumour ascends and descends with equal facility.

“ I have accomplished reduction in a mass in more than twenty instances, partly of herniæ either strangulated or otherwise irreducible, partly of empty hernial sacs. It is effected most easily in internal inguinal, then in crural, and lastly in external inguinal herniæ. I have never succeeded in the umbilical ruptures of adults.

“ When the sac is of considerable size, when it adheres closely to the surrounding parts, when the aponeurotic opening is small and in the form of a canal, circumstances which are frequently united in external inguinal herniæ, this kind of reduction is almost impossible, unless great force is employed. If accomplished at all in external inguinal hernia, it is generally incomplete, and the swelling reappears as soon as the efforts at reduction are discontinued. If, however, the sac has been pushed completely through the ring, we shall experience considerable difficulty in bringing it down again ; or we may find it impossible to do so.

“ The replacement in a mass of a hernia strictured by the neck of the sac takes place most easily when the aponeurotic ring is of large size and short, when the sac and its neck are loosely connected to the surrounding parts, and when the protruded viscera adhere together and to the sac, so that reduction in the usual way is impracticable. In a case of internal inguinal, and in another of crural hernia, I found that the tumour could only be returned in a mass, although the neck of the sac was not narrow, in consequence of close adhesions between the protruded parts and their peritoneal covering.

“An empty hernial sac may be reduced in a mass in the manner just described.”*

In the foregoing observations M. CLOQUET relates the result of his trials on the reduction of ruptures in the dead subject. I have never seen a rupture reduced in a mass in this manner in the living body; nor have I seen any example of such a reduction in pathological collections. In reference to the same point, Mr. KEY says, “I have never known this to take place, when the hernia has been reduced by the taxis.”† Hence, as well as from considering all the circumstances of the case, I conclude that it must be a rare occurrence. It has, however, happened in the practice of SCARPA, SABATIER, DUPUYTREN, and SANSON,‡ as will be seen by cases detailed in CHAPTER VIII. SECT. II. where mention is made of the treatment that might be required under such circumstances.

SIR CHARLES BELL shortly mentions a case, in which he had the opportunity of examining the parts after death. “A patient was brought into the hospital moribund, and died; and we had an opportunity of examining him. He had been operated upon by the taxis, and the surgeon was convinced that he had done everything required of him. A tumour was discovered quite within the muscular walls of the abdomen, which proved to be the strangulated intestine within the peritoneal sac; so that the surgeon had reduced the sac, and the intestine within it; and the stricture which produced the strangulation being in the mouth of the sac, there was no relief, and the patient died.”§

He met with another instance, in some respects analogous to these cases of reduction in a mass. It ended fatally, although the intestine could be returned. The stricture was formed by the neck of the sac, which, together with the neighbouring portion of the abdominal peritoneum, was detached from the aponeurotic ring and the contiguous part of the abdominal parietes, so as to allow the intestine, although closely confined by the stricture, to descend into the scrotum and pass back again freely. In the latter case the neck of the sac was carried into the abdomen, and the detached portion of peritoneum was distended by the stric-

* *Ibid.* p. 113—116.

† *Memoir on the advantages and practicability, &c.* p. 121.

‡ DUPUYTREN had seen six, and SANSON three instances. *Dictionnaire de médecine et de chirurgie pratiques*; tom. ix. p. 571.

§ *London Medical Gazette*; vol. xiii. p. 926.

tured bowel, so as to form a swelling behind the upper opening of the inguinal canal. When the intestine passed into the scrotum, this internal tumour was effaced, and the neck of the sac was brought into contact with the internal abdominal ring.* As the rupture appears to have been congenital, we see a sufficient reason why the body and the fundus of the sac remained firmly adherent, although the neck and the portion of peritoneum behind the ring had become loosened, and why, consequently, the former part did not change its position, although the strictured neck and the intestine ascended and descended freely through the ring.

SECTION II.—CONSTRUCTION AND USE OF TRUSSES.

Our object, in the application of a truss, is to close the openings through which the viscera protrude, by means of external pressure; and thereby, after the parts have been reduced, to prevent a second descent. The instruments employed for this purpose have been brought to great perfection in the course of the last century; and, when we consider the great number of ruptured persons, together with the essential relief which they derive from these bandages, we shall not fail to regard them as one of the most useful productions of modern surgery.

A well-contrived bandage should exert a sufficient and uniform pressure, without incommoding the patient, or being easily susceptible of derangement.

The different kinds of herniary bandages may be reduced to the two classes of elastic and non-elastic. The latter are composed of leather, fustian, dimity, or similar materials. These cannot be depended on, and are, therefore, seldom employed. Since the size of the abdomen varies, according to the different states of the viscera, and to the motions of its parietes in respiration, a non-elastic bandage must vary constantly in its degree of tightness, and keep up either too great or too little pressure. The omentum or intestine easily slips out when the opening is not exactly closed, and

* *London Medical Gazette*; vol. i. p. 485, 486: with two figures furnished by SIR C. BELL.

the patient who wears such a bandage must be in a state of constant insecurity. They who lead an active life, or are obliged to use laborious exertions, will be more particularly exposed to risk. If the patient, after experiencing these defects, endeavours to remedy them by drawing the bandage tighter, he may confine the viscera, but he produces other inconveniences. The increased pressure injures the spermatic cord, and may affect the testicle: the integuments become red, painful, and excoriated; and the bandage must be entirely laid aside, until the parts have recovered. In Germany, where this kind of bandage is much employed, RICHTER* has often seen painful tumefaction of the testicle, hydrocele, and even cirsocele, produced by it, and entirely dissipated by the employment of a proper truss. He also saw the pad of a non-elastic bandage excite, in the region of the abdominal ring, a considerable inflammation, which terminated after a few days in suppuration. The hernia never appeared again after the cure of the abscess. The inflammation had extended to the neck of the sac, and obliterated that part.

Elastic trusses, when well fitted, may be depended on, as they keep up an uniform pressure under every variation of circumstances. They yield when the abdomen is distended; and, in consequence of their elasticity, still remain closely applied when its volume diminishes.

The valuable properties of this instrument depend entirely on its spring, which keeps the pad constantly pressed against the herniary opening; and gives it a power of reaction, by which an uniform pressure is maintained under varying attitudes. This elasticity can be attained only by the employment of steel. In the first attempts at procuring something better than the non-elastic bandages, iron was used; and the instruments fabricated by BLEGNY at Paris were constructed of this metal. It is obviously inadequate to accomplish the ends which we have in view in treating herniæ; yet it is only at a comparatively recent period that its defects have been discovered. ARNAUD, whose writings contain much valuable information on this subject, recommends for the spring of a truss a mixture of malleable iron and steel; so that the instrument may be moulded by the hand to any particular shape which the patient may require; and he is followed in this point even by RICHTER.

* *Traité des hernies*; p. 24.

A truss, which admits of such management, must in effect be exposed more or less to the objections which apply to the non-elastic bandage; and the only material, which possesses the requisite qualities of firmness and elasticity, is well-tempered steel.

The most important part, then, of an elastic truss, consists of a flat and narrow piece of steel, adapted to the form of the body, and called the *spring*. This passes round the affected side of the trunk, terminates anteriorly on an expanded plate of iron, to which it is rivetted, placed over the mouth of the sac, and extends behind to various distances beyond the spine.* The posterior surface of the plate is furnished with a convex cushion termed the *pad*, and adapted in form and size to the opening which it is designed to close. The spring is covered externally with leather, and that it may sit easily on the body, its inner surface is lined with some soft substance;† a strong strap extending from its posterior end passes round the sound side of the trunk, and is fastened to a hook on the front of the plate. This strap, being perforated by several holes, enables the patient to tighten or loosen the truss at pleasure.

The curvature of the spring should be accommodated to the breadth of the haunch in each individual, for this varies considerably. Where the curve is too small, the pad cannot sit with sufficient firmness on the ring; and, in the contrary case, the body of the bandage cannot apply exactly, but must be liable to derangement. The posterior extremity of the half circle should have its internal surface directed a little downwards; while that of the front end and pad should be turned slightly upwards, to make it fit closely. In order that the pressure of the instrument should be equally distributed over the whole surface, on which it rests, it should bear equally at all points. Hence the obvious importance of having the spring carefully ac-

* The spring of the truss has commonly been a semicircle, with the posterior end resting on the spine. CAMPER proposed to carry it round to the anterior superior spine of the sound side; and SCARPA approves that plan. Trusses of that form sit with a firmness, which cannot be given to the others by tightening the strap. They keep up the rupture much better than even a stronger spring of the other kind. M. i. § 32.

† This covering must be necessarily affected by the perspiration of the wearer; and where this is considerable it will injure the spring. Hare-skin, with the hair outwards, has been recommended as the best material in such cases.

commodated to the shape of the pelvis. The makers of trusses should be provided with casts of the human figure for this purpose.

A piece of cork is fastened to the posterior surface of the iron plate; and this is covered with leather, stuffed with hair or wool, so as to give it the due firmness, and to bring it to a slight and uniform convexity. When the pad is soft, the pressure must be insufficient; and if it is hard, the soft parts may suffer; hence we should suppose that wood would not be a suitable material. Wooden blocks or pads have, however, lately been employed in the United States, it is said with considerable success, not merely for the purpose of keeping up ruptures, but also with a view of producing a radical cure. This subject will be considered in the following chapter. A French author * has proposed a bladder filled with air as a substitute for hair or wool in the pad. I know not whether this proposal has been much tried. The bladder would probably soon become flaccid, and the materials already mentioned answer every purpose.

Various inconveniences arise from the common fault of making the pad too convex at its middle part. The elevated centre pressing strongly, while the circumference is applied less closely, the parts may easily escape at the sides, particularly under a slight derangement, which is a very probable occurrence. Moreover, since the force of the spring must be exerted almost entirely on one spot of the pad, a moderate degree of pressure quickly becomes painful. If the pad be flattened, it applies equally throughout, and the action of the spring is distributed over its whole surface; it will not produce pain, even although the elasticity of the bandage be considerable.

A too convex pad may also be injurious, when accurately applied, by pressing the external soft parts into the opening; thus keeping them distended, and preventing that contraction on which a radical cure depends. Its partial and considerable pressure may separate the tendinous fibres near the ring, and thus facilitate a second protrusion. We must not, however, run into the opposite error of making the pad too flat: elevation in the circumference is not only useless, but actually injurious. Pressure on the spermatic cord would be a probable effect of such a construction.

* HERITZ, in the *Journal de Médecine*, tom. xxxvi.

When the pad possesses the proper figure, the surgeon must be careful to ascertain that it presses uniformly in the whole of its surface. The upper part sitting too closely allows the viscera to escape below; while an undue pressure at the lower part injures the spermatic vessels, and admits of protrusion above. When it rests flat on the opening, and bears equally on all parts, the pressure is divided so as to cause no pain or inconvenience.

The size of the pad should be sufficient to cover the opening, and allow a few lines over in every direction.

A patient, who is ruptured on both sides of the body, must have a spring extending round the back and sides of the pelvis, and terminating anteriorly in two plates, each of which is furnished with a cushion for the hernia of its own side. A strap, sewed to one plate, and attached to a hook on the opposite side, serves to connect these together. A double truss is sometimes made with two distinct springs, but it does not possess the stability of the former kind. The distance between the two openings must be carefully marked in taking the measure for a double truss, and accurately observed by the maker in executing his instrument.

When in inguinal or crural ruptures the pad rises higher than its proper situation, the truss receives the addition of a thigh-strap, which passes from the back of the spring under the affected thigh, and is attached to the plate by means of a hook. The inconvenience arising from the opposite defect, in which the pad sinks too low, must be remedied by a band going over the shoulders: we may sometimes accomplish our object without making any addition to the truss, by merely changing the position of the hook to which the strap of the truss is fastened: when the pad rises too high, this hook should be placed towards the lower part of the plate, and *vice versâ*. A truss exactly adapted to the figure of the body will probably not need such additions.

The measure for a truss is taken by passing a string round the body, from the point at which the viscera are found to protrude, in that situation which it is intended that the instrument should occupy. In order to obtain a more exact representation of the form of the trunk, it is proposed to take the measure with a double flexible wire, which may be bent exactly to the form of the parts. In either case, the alteration, made by covering the spring, re-

quires that an inch should be allowed beyond the measure.*

In order that a ruptured person may derive all the benefit which a truss can afford, and avoid, as much as possible, the inconveniences connected with its use, care should be taken that the spring be constructed of a due strength; that the instrument sit close in every part, so as not to make any partial or irregular pressure; that it be so adjusted as not to be displaced in the necessary motions of the body; and that the form of the pad be adapted to the part on which it lies. When the measure has been properly taken, much must depend on the execution of the artist; yet attention on the part of the surgeon may often detect the source of inconvenience.

The strength of the pressure will be in proportion to the thickness and breadth of the spring. Small ruptures, and those which occur in children, or in persons who do not lead a laborious life, and are not obliged to make great exertions, may be retained by a weaker truss than is required for cases of the opposite description. As the omentum escapes from the abdomen more readily than the intestines, an epiplocele requires a proportionally stronger spring than an intestinal rupture. When the hernia is large and old, or the subject of it is exposed to the necessity of frequent laborious exertions, a strong truss is necessary. The patient should on no account wear a more powerful spring than is sufficient to keep up the rupture, since the long-continued pressure of the pad must have the effect of weakening the abdominal ring and surrounding parts.

When the case requires so strong a spring, that the pressure on the spermatic cord is painful, the pad may be constructed with a hollow, to admit this part. A similar contrivance may be found useful when rupture is combined with disease of the testis or spermatic cord.

In cases where the enlargement of the latter part has

* The following works may be consulted on the construction of trusses :—

DE LAUNAY, *Bandage élastique pour les Hernies*; *Mém. de l'Acad. de Chir.* tom. i. p. 697.

CAMPER; *Mémoire sur la Construction des Bandages pour les Hernies*; *ibid.* tom v. p. 626.

JUVILLE; *Traité des Bandages Herniaires*; dans lequel on trouve, indépendamment des bandages ordinaires, des machines propres à remédier aux chûtes de la matrice et du rectum, à servir de recipient dans le cas d'anus artificiel, d'incontinence d'urine, &c. With fourteen coloured plates. Paris, 1786, 8vo.

SALMON'S *Mechanical Analysis of Trusses*, &c. 8vo. London.

rendered it impossible to keep up ruptures by the common instruments, a pad, having a projection in its middle, just sufficient to fill up the opening, has been employed with success.*

The form of the spring, and consequently the position which it occupies at the side of the pelvis, are points of great importance in obviating the possibility of derangement from the motions of the trunk or hip. Sometimes it is carried horizontally round from the pad; and then it goes so near to the trochanter major as to be easily displaced by the motions of the thigh. To avoid this defect, it has been brought midway between the crista of the ilium and the trochanter; but the same inconvenience exists in a diminished degree.

Trusses are sometimes fabricated with a pad moveable on the spring, instead of being rivetted to it. This may be inclined upwards or downwards, according to the form of the abdomen; and it is retained at the desired point by a spring fitting into the teeth of a rack. In others the plate contains a screw, by which the cushion is pushed further inward, or allowed to recede at pleasure. A simple instrument, when well made, answers every end which can be accomplished by these more complicated ones, and is therefore preferable to them for reasons which must be obvious.

A compress of folded calico, placed under the pad, and renewed daily, preserves the truss from the effects of perspiration; and certainly in many instances increases the beneficial operation of the instrument, although we cannot explain the principles on which this effect is produced.

If the unusual pressure should at first occasion redness and pain of the integuments, and even excoriation, the use of fuller's earth or powdered lapis calaminaris will remove these effects.

The pad of the truss should be placed over the opening at which the viscera have protruded: hence, in a small, or recently formed inguinal rupture, the proper position for it is considerably exterior to the pubes, and rather above that bone. The surgeon must, in all cases, endeavour to ascertain the precise point at which the rupture has taken place, and that is the right position for the pad. When he is going to apply the truss, he will place it round the

* Gooch's *Works*, vol. ii. p. 221.

pelvis, and put the patient into a recumbent position. Having carefully replaced the whole protrusion, he presses on the opening with one hand, and with the other applies the pad of the truss in its proper situation, holding it there until he has adjusted the rest of the instrument, and fastened the strap to the plate. The patient will follow the same plan in applying the instrument himself; and the most convenient time for this purpose is before he rises, as the viscera generally re-enter the abdomen during the night, and do not descend again until he assumes the erect position.

When the bandage is applied, the patient rises, and the surgeon examines it carefully in every point to see whether the skin is folded, pinched, or too much compressed in any situation. He may walk, cough, and make slight efforts, for the purpose of ascertaining whether the parts are well kept up; and if they are not, it must arise from some error in the construction or application of the bandage, which will require attention.

If the viscera are well supported by the instrument, the patient may follow his ordinary occupations: yet he should bear in mind the affected part. Violent exercise or bodily exertion, and excess of eating or drinking, should be avoided. The surgeon should examine him in two or three days. If any part has escaped, or if there be swelling or pain in the spermatic cord, some imperfection must exist in the instrument, and ought to be remedied. The omentum often escapes, and great difficulty is frequently experienced in keeping it reduced. It may be necessary, if the pad retains its situation on the ring, and the truss in general sits well, to tighten the strap a little. Some individuals find the pressure of the truss extremely disagreeable at first, although it is no more than the case requires. These may wear a weak instrument for an hour or two daily, increasing the length of each application, until habit shall have rendered its constant use supportable.

SECT. III.—EFFECTS OF THE TRUSS; RETURN OF THE SAC ; ITS CONTRACTION, OBLITERATION, AND CLOSURE BY ADHESION.

WEARING an elastic truss not only keeps the viscera within the abdominal cavity, and thereby protects the ruptured person from all the dangers, to which the existence of his complaint would otherwise expose him ; but, if continued for a sufficient length of time, even affords a prospect of radical cure. The constant pressure of the pad keeps the neck of the rupture empty, and thus favours the commencement and progress of those natural processes, by which recurrence of the complaint may be prevented ; viz. spontaneous reduction, or gradual contraction of the sac, with obliteration of its neck or body, and agglutination of its sides. The spontaneous reduction of the sac is considered in CHAPTER I. SECTION 3.

The neck of the sac, when no longer distended, contracts, in obedience to the general law, by which all hollow parts of the body adapt themselves to their contents : the process is analogous to the closure of the membranous communication between the cavity of the peritoneum and that of the tunica vaginalis after the descent of the testicle.

The pressure of the truss may excite slow inflammation and thickening, both of the empty sac, and of the surrounding cellular substance, and thus assist and accelerate the contraction of the neck, and the separation of the sac from the peritoneum. I have seen empty hernial sacs, with the neck either contracted throughout or entirely closed to a greater or less distance. Obliteration of the cavity of the sac at its entrance, adhesions of the formerly protruded parts at the orifice, and thickening both of the hernial sac and the surrounding cellular tissue, have been found by others in the examination of individuals, in whom the use of the truss had effected a radical cure.*

* Paré found an adhesion of the omentum to the orifice of the sac in a patient radically cured by a truss. *Works*, book viii. ch. xvi.

ARNAUD mentions a case of epiplocele, which was cured in six or eight months. The mouth of the sac was obliterated, and the omentum, in a flattened form, adhered to it generally. *Mém. de Chir.* ii. 474. In another instance the neck was obliterated, and fluid collected below. *Ibid.* i. 75. See also PETIT *Tr. des Mal. Chir.* tom. ii. 285 ; and again at p. 377, where he

I met with two very large and apparently old scrotal herniæ in the same subject. On one side the omentum was adherent, the mouth of the sac very large, and the abdominal ring greatly dilated. Here, of course, no truss could have been worn. The ring presented the same appearance externally on the opposite side; but the hernial sac was empty, although its extent and the greatly enlarged state of the cremaster muscle covering it, with all other circumstances, indicated that it was an old, and had been a very large rupture. The mouth of the sac was gathered into folds, and closed by slight adhesions; and the cellular substance surrounding it was greatly thickened. There can be no doubt that these appearances were caused by the pressure of a truss, which had thus nearly effected a radical cure in a very unpromising case.

The extensive opportunities enjoyed by M. J. CLOQUET of examining after death the bodies of those who had been affected with rupture, enabled him to trace through all their stages the reduction and contraction of the sac, as well as the other changes produced in it by the use of the truss. The principal points noticed by this indefatigable and accurate observer are comprised in the following statement.

The contraction of the sac generally, but not invariably, begins at the neck. It takes place more readily when the neck is small, and not closely adherent to the aponeurotic ring.

The mouth of the sac, as it contracts, is wrinkled, thrown into folds, and at last obliterated. The folds are radiated, more or less considerable, various in length, and divergent; they are lost in the surrounding peritoneum, from which they are distinguished by their opaque whitish appearance. Altogether they represent wrinkled cicatrices with radiated folds, and resemble true cicatrices of the peritoneum resulting from wounds; but, in order to distinguish those appearances, which are left after the mouth of the sac has been obliterated, M. CLOQUET calls them *stigmata of the hernial sac*. The peritoneum is often thickened at this point, and

thus expresses himself: "J'ai trouvé qu'aux uns les parties s'étoient rendues adhérentes à la portion du péritoine, qui avoit autrefois formé le sac; qu'à d'autres, cette partie étoit devenue épaisse, et adhérente avec les anneaux des muscles, avec le cordon des vaisseaux, et à tout le voisinage; que le tout réuni ensemble formoit un rempart impenetrable aux parties du ventre." SCHMUCKER has often seen the mouth of the sac obliterated by adhesion. *Chirurgische Wahrnehmungen*, book ii. p. 241.

forms a whitish opaque plate, from the circumference of which these stigmata diverge.

Between these folds there are sometimes very small cul-de-sacs, which will admit the end of a probe. Occasionally there are small canals, forming a communication between the cavity of the sac and the abdomen. M. CLOQUET has seen sacs, thus partially obliterated at the neck, and communicating with the abdomen by four or five extremely small separate canals.

The stigmata are sometimes very conspicuous, so as to attract attention immediately, when we examine the peritoneum lining the aponeurotic openings: they may be less marked, and not discoverable without close attention: sometimes they are not present at all, the sac having become detached from the peritoneum in the same manner as the tunica vaginalis. In these various cases, the body of the sac, separated from the peritoneum, is either obliterated by a kind of cellular conversion, or remains hollow, and contains a serous exhalation.

Sometimes the contraction and the formation of stigmata are partial.

The obliteration does not take place so easily, when the aponeurotic ring is large, and closely adherent to the neck of the sac.

Not unfrequently the mouth of the sac adheres, by its radiated stigmata, to the viscera, which had been protruded.

The adhesions, by which the stigmata are formed, generally take place without inflammation or the production of accidental membranes.

The hernial sac, when separated from the peritoneum by the obliteration of its neck, constitutes a serous cyst, varying in form and thickness, and exhibiting the changes which are met with in hernial sacs before such detachment.

When the orifice is closed, if the membranous prolongation, which connects the sac to the peritoneum, should disappear, we cannot distinguish it from an accidental serous cyst, unless, indeed, stigmata should still be found at the upper part. The sac is then, like the tunica vaginalis, insulated from the peritoneum.

“The sac, when its neck has been obliterated, and its cavity no longer communicates with the abdomen, undergoes diminution of volume, a kind of atrophy. If its connexions to the surrounding parts are not strong, it shrinks in

all directions, becoming smaller and shorter, ascends towards the abdomen, and is found immediately behind the stigmata of its obliterated neck : it returns into the abdomen, lying between the ring and the peritoneum, or it remains below in the form of a small serous cavity. In this state of atrophy, its parietes are generally thin and semi-transparent ; sometimes they are thick : I have seen some which were white, cartilaginous, and more than a line in thickness. I have met with serous cysts, resulting from the atrophy of hernial sacs, when the cavity was merely large enough to hold a kidney-bean or a pea. I have dissected many, in which the cavity had disappeared ; they presented a small solid body, fibro-cartilaginous, surrounded by radiated folds.

“ When the hernial sac adheres closely to the parts around, for instance, to the cord or the round ligament, or when it adheres to the surface of another sac, it contracts, particularly in breadth, and remains in the shape of an elongated serous cyst, of which the sides vary in thickness, being yellowish white, opaque, and easily torn, or cellular, fine, semi-transparent, and more firm.

“ The internal surface of a sac separated from the peritoneum, is in general perfectly smooth and moistened by serous exhalation, but it may become more and more dry, losing its polished surface, and appearing dull or faded. The sides, no longer moistened by serous fluid, come into immediate contact, and adhere together without inflammation or the formation of accidental membranes. The adhesions, at first easily separable, become more and more close. They may begin at various points, or at one only. In the former case, if the sac is large, the cavity becomes separated into compartments. I have found as many as three or four of these separated by partial adhesions. These adhesions are of a similar nature to those which form the stigmata after the obliteration of the neck of the sac. They take place in consequence of the sides being brought into apposition, and of the serous fluid being absorbed, by a kind of drying, if I may use that term : they occur as it were naturally ; they are spontaneous, and very different from such as are consequent on inflammation, and on the effusion and organisation of coagulating lymph. In the latter case the sides of the sac become thicker ; while, in the former, they are thinned.

“ The formation and progress of the adhesions now de-

scribed, could be well traced in a hernial sac which I met with, exhibiting three cavities placed in succession, and separated by complete septa. The process of obliteration had begun in the lowest cavity, or the sac first formed; it presented partial adhesions; its cavity was dry, with an irregular, and as it were, cellular surface, which presented, on examination under water, very slender, papillary, filiform growths. The second sac was smoother, but dull, dry, and without adhesion; the third sac, still communicating with the abdomen, was smooth, polished, and abundantly lubricated. I found the same appearances in three instances of sacs with two cavities.

“The adhesions just described at last become general. The sac usually preserves its form but loses its cavity; in other instances, the form is not maintained, the sac presenting a cylindrical or irregular fibrous cord, confounded with the neighbouring cellular tissue. Sometimes the sac disappears; being empty, insulated from the peritoneum, and no longer fulfilling its purpose, it undergoes absorption, as we see in the Thymus, and partially in the umbilical arteries after birth.

“Sometimes hernial sacs, although kept empty, and presenting all the conditions favourable to contraction and obliteration, contract but little, and are not separated from the peritoneum.

“The connexion of the hernial sac with the abdomen may be interrupted by adhesion of the protruded parts plugging up the orifice; by adventitious membranes, formed in consequence of inflammation; by a tumour developed near the ring, or the formation of a new hernial sac; by a mass of fat growing in the cord or round ligament.”*

As trusses, when skilfully employed, often excite, without pain, a slow inflammation, which terminates in the desirable object of obliterating the mouth of the peritoneal process, and thus effecting a radical cure; so, when placed with improper tightness, they have caused violent inflammation and suppuration, and exposed the life of the patient to great risk.†

* *Recherches sur les causes et l'anatomie, &c.*, p. 119—136. The notes to the passages above quoted, contain the details of dissections supporting the various statements; and the subject is further illustrated by several figures, engraved after drawings by the author. See plate. iii. fig. 3; plate iv. fig. 6 and 7; plate v. fig. 4, 6, 7; plate vi. fig. 6, 7; plate vii. fig. 8, 9; plate x. fig. 4, 5, 6.

† SCHMUCKER; *Chir. Wahrnehm.* book ii. p. 340, 342. They were two

In proportion as the patient is younger, may we more reasonably expect a radical cure from the use of the truss. We may, indeed, speak with confidence on this point in the ruptures of children. Although cures sometimes take place in adults, they are not effected frequently; and they are not to be expected in old subjects.

Some practitioners are inclined to prohibit the use of a steel truss in infants, but there is no foundation for this exception, and the instrument may be employed with perfect safety in the youngest persons. No benefit can be derived from the employment of a non-elastic bandage, which is sometimes used in infants; and we may lay down a general rule, that the chance of a permanent cure is greater, the sooner we begin to employ the steel truss. The resistance in these cases is but weak, and a strong spring is therefore unnecessary as well as injurious.

A small and recent hernia, which has been produced by accidental exertion, affords the most favourable prospect of a radical cure from the application of a truss; which, on the contrary, offers nothing more than palliation in large and old ruptures, and those whose origin may be referred to predisposition. An epiplocele is less likely to be permanently cured, on account of the difficulty of keeping it constantly reduced.

The truss must be worn without intermission by a person who hopes that its employment may cause such a contraction of the ring and sac, as will prevent any future descent of the viscera. The same rule should be observed by all, who are obliged to wear these instruments. It would be better indeed that no truss should ever be used, than for the patient, after wearing one for some time, to lay it aside suddenly; for a hernia reproduced under these circumstances is much exposed to the occurrence of strangulation, in consequence of the thickening and contraction which are going on at the neck of the sac; and such an incarceration is particularly dangerous. If, however, the parts should not be strictured, their protrusion dilates the sac and ring, which had begun to contract, and destroys the benefit already derived; the cure therefore commences again from this period. The inconvenience and restraint, occasioned by the first application of the instrument, in-

omental herniæ; copious suppuration and mortification followed; but the patient recovered, after incurring great risk. A case related by Mr. WILMER terminated fatally from the same cause. Ed. ii. p. 84.

duce us to allow the patient to sleep without it for a short time ; enjoining him not to remove it before he has lain down in bed, and to re-apply it before he rises. This practice must be discontinued as soon as the patient's feelings will admit of it ; and the constant wearing of the truss should then be strictly enforced. It may be said, that the posture of the body in bed is a sufficient protection against protrusion, and it is well known, that ruptures often recede spontaneously in the night. Yet a cough, or any exertion, may easily renew the descent, even in the recumbent position ; and the patient who wears the instrument constantly is on the safe side. He ought to have at least two trusses, and will find it pleasant to change them in the morning. When the covering is much worn, or rendered irritating by the perspiration which it has imbibed, it should be immediately renewed.

When this plan of treatment has effected a radical cure, it may be discontinued ; but, as the circumstances which indicate this occurrence are not clear, prudence requires great caution in such a change. If the contraction of the sac, or the agglutination of its sides be not complete, and the parts yield to a fresh protrusion, the patient is thrown back to the point from which he set out. He may begin with leaving off the truss at night : let him afterwards place his hand on the opening, and then cough, hold his breath, or make slight efforts ; if no tumour is occasioned, nor any preternatural impulse, the bandage may be left off at times during the day, all considerable exertions being carefully avoided. The longer he delays its entire abandonment, the greater is his security : and it is certainly better to continue wearing a truss beyond the period of actual necessity, than to leave it off too soon.

It must be allowed, after all, that trusses of the best construction, and most judicious application, will not prove a certain defence against a protrusion. Various accidental circumstances may derange the instrument, and a portion of intestine, or more particularly of omentum, may slip out under the pad. For this reason, violent exertion should be avoided as much as possible ; and the patient, when obliged to make any considerable effort, should press on the pad with his hand. If a protrusion should occur, let him immediately take off the truss, lie down, and either return the part himself, or send for his surgical attendant.

CHAPTER VI.

THE RADICAL CURE OF RUPTURES.

IT may be collected, from the contents of the preceding chapter, that, in the majority of ruptures, trusses can only be regarded as a means of confining the viscera within the abdomen, thereby obviating the inconveniences which the unrestrained increase of the swelling would occasion, and of protecting the patient against the constant danger of incarceration. It has been there explained, that the complaint can be cured by these instruments, only under certain favourable circumstances; and that, even then, a considerable time must elapse before the desirable termination can be reasonably expected. In general, therefore, persons afflicted with ruptures must wear the truss constantly; and further, since this is not in all cases a perfect protection, they also incur the risk, which indeed is slight, of the complaint assuming a more formidable shape. Again, in many cases, it is difficult to keep the parts in their place, even with the help of well-constructed and carefully-applied trusses: their occasional and sometimes frequent protrusion is attended with pain and danger, incapacitating the patient for active exertion, and constituting a source of constant apprehension. The inconvenience, the suffering, the danger and anxiety are still greater in irreducible ruptures. Patients and surgeons have been equally desirous to find out a more effectual remedy for these evils, to discover some method of complete cure, which should include, not only a return of the protruded parts, but also a security against any fresh descent. The means designed to accomplish this object are called the *radical*, in opposition to the use of trusses, or the *palliative* cure.

The several proceedings proposed with this view, whether they may appear to us calculated to attain it or not, will be considered in the present chapter.

Many of these methods, having been devised in times when the sciences of anatomy and surgery can hardly be said to have existed, and being not only rude and barbarous, incapable of effecting the proposed object, and in some cases involving serious mutilation, such as the loss of the testicle, but also attended with great risk of life, which often fell a sacrifice, may now be deemed obsolete, and therefore do not require detailed description or lengthened consideration. A general account of them, however, is necessary in a work professing to exhibit a view of the whole subject; more particularly as some, even of the most dangerous, were still practised in the latter half of the past century; as others have been in use more recently, and are not yet entirely abandoned, and as they are connected with the important practical question respecting the expediency of attempting to cure radically, incarcerated, and even irreducible ruptures.

External applications. —A great variety of local applications, particularly astringents and tonics, has been tried, in the treatment of herniæ. As these act only on the surface of the skin, we cannot ascribe to them any influence on the rupture. They are, however, harmless, and very different in that respect from the operative methods by which the cure of ruptures has been attempted.

Among these may be mentioned poultices made with the meal of barley and of beans, with aloes, mastic, and Armenian bole; iron filings to the swelling, and the internal use of the magnet: powders of dragon's blood, mastic, incense, cypress cones, mixed with tar and white of egg: the *emplastrum ad hernias*, of which there are several formulæ, consisting of various resinous and balsamic substances, with vegetable matters, vitriol, and the Lemnian bole, or *terra sigillata*; bags of herbs steeped with vinegar; powder of oak bark or tan moistened with wine; the remedy of the Prior de Cabrière, red wine to the part, with muriatic acid internally. Even of late years the pads of trusses have sometimes been filled with astringent and tonic substances, such as powder of galls and cypress cones, with the addition of opium and subcarbonate of ammonia. Vesication of the integuments has also been resorted to. The surgical writers, who have recommended these local remedies, acknowledge that they succeed only in young subjects.

Of the operative proceedings, adopted for the purpose

of radically curing ruptures, one of the mildest was *incision*; that is, dividing the integuments and opening the sac, after the intestines had been replaced, then dressing the wound so that it should be healed by granulation; this was, in short, the operation for strangulated hernia performed on reducible ruptures. In the more difficult and dangerous proceeding of *excision*, a portion of the integuments was removed, and the sac, or a part of it, was cut away. These methods were followed by CELSUS,* who prohibits operation when symptoms of strangulation are present, and when the swelling contains a large quantity of intestine. In cases of epiplocele he pushed back the omentum, if it was a small piece; when it was larger, he left it out, and applied escharotics until it fell off. He says that some passed a needle through the middle of the omentum, and then tied it in two portions. He objects to cutting it away, on account of the hemorrhage.

The two following plans, which belong strictly to the head of external applications, are too serious in their nature and effects to be considered in conjunction with such harmless means as poultices, plasters, and powders.

The *cure by cautery*, which was known to PAULUS, and is mentioned by the Arabians, and the earlier of the modern surgical authors in Italy and France, is thus described by Mr. POTT.†

“After a proper time spent in fasting and purging, the patient must be put into an erect posture, and by coughing or sneezing is to make the intestine project in the groin as much as possible; when the place and circumference of such projection are to be marked out with ink. Then the patient being laid upon his back, the intestine is to be returned fairly into the belly, and a red-hot cautery is to be applied according to the extent of the marked line. For this purpose, cauteries of different sizes, shapes, and figures have been devised: annular, elliptical, circular, like the Greek letter gamma, &c. The writers who have given an account of this operation have differed a good deal from each other, not only in the size and figure of the cautery, but in the depth of its effect. Some have directed it to be repeated, so as to denude the os pubis; others direct the skin only be destroyed by the iron; the cellular membrane, sac, periosteum, &c. with repeated escharotic

* Lib. vii. cap. 20, 21.

† Works; vol. ii. p. 177.

applications. But in all of them the exfoliation of the bone is made a necessary part of the process; eschar and sloughs being separated, and the exfoliations cast off, the patient is ordered to observe an extremely strict regimen, to lie on his back during the cure, and to wear a bandage for some time after, in order to prevent a new descent of the parts, which, notwithstanding all the pain, and all the hazard the patient had undergone, he was still liable to."

A more cautious mode of employing the cautery consisted in exposing the hernia without opening it, raising and drawing it aside, and then deeply cauterising the ring with a hot iron. Some opened the sac, and touched its neck with the cautery.

Another of the ancient methods mentioned by the same authors as the foregoing plan of cautery, is the *cure by caustic*, thus described by Mr. POTT.*

"The patient being laid on his back, and the parts returned into the belly, a piece of caustic is to be applied on the skin covering the opening in the abdominal tendon, so large as to produce an eschar about the size of half-a-crown. Some suffer this eschar to separate, others divide it, and then by the repeated application of escharotics, destroy the membrana cellulosa, with as much of the hernial sac as can be done without injuring the spermatic vessels. For this purpose different kinds of corrosive applications have been made use of; pastes loaded with sublimate or arsenic; the stirpes brassicæ burnt; the tithymalus; the lapis infernalis alone, or with suet and opium; oil of vitriol; with many others, according to the humour of the operator. But though the means are somewhat different from each other, the end or intention in the use of them all is the same, viz. to remove or destroy the skin and cellular membrane covering the tumour, together with a part of the hernial sac, and by that means to procure such an incarnation, as by its firmness and its attachment to the bone, and parts adjacent, shall prevent a new descent of either gut or caul."

Strong escharotics, such as the sulphuric and nitric acids, the potassa fusa, and muriate of antimony, were sometimes applied to the interior of the sac.

* *Works*; vol. ii. p. 179.

Messrs. GAUTHIER and MAGET* are the last who have employed caustic with the view of radically curing herniæ. They used sulphuric acid, applying it to the skin opposite to the ring, so as to form a small eschar. When this separated, if the sac were not sufficiently exposed, the application was renewed, until it was destroyed. The cure was then conducted by simple dressings, as in a common ulcer, and the cicatrix thus formed was expected to oppose the future descent of the abdominal viscera. The dangers of the treatment, and the insuperable objections to its adoption, are ably pointed out by M. BORDENAVE.† Of three patients, subjects of experiment at one of the hospitals in Paris, one died, one suffered a relapse, and a third escaped with a swelling of the spermatic cord. Perforation of the intestine, and fatal gangrene of the scrotum, were other consequences of this method. Such wanton trifling with human life is of itself sufficient to excite our utmost indignation, even without the aggravating circumstance of learning that the name of DE LA CONDAMINE is in the list of victims to this destructive quackery.‡

Ligature and suture of the sac.—Several methods have been practised of tying or sewing up the hernial sac, either alone, or in conjunction with other neighbouring parts. Thus some operators having passed a needle and ligature through the skin and under the sac, placed a piece of wood between the two ends, and then tied them. They drew the knot closer and closer, until the included parts had perished. As the spermatic cord was intercepted, and the testis consequently rendered useless, that organ was removed: but some professed to include the sac only. Others removed the testicle at once, and tied the sac.

In order to save the testis, it was proposed to lay bare and open the sac, and then to sew it up with an uninterrupted suture. This method, having for its object to preserve the testis, and to maintain it in a state capable of fulfilling its function—that of giving subjects to the king—was styled the *royal stitch*.

Sometimes the sac was exposed and tied, without being

* *Diss. sur l'usage des caustiques pour la guérison radicale des hernies*; Paris, 8vo. 1774.

† *Mémoire sur le danger des caustiques pour la guérison radicale des hernies*; in the *Mem. de l'Acad. Royale de Chirurgie*; tom. v. p. 651; and the supplement, p. 881.

‡ *Ibid.* p. 668.

opened ; or, having been exposed and separated, a needle was passed through its middle, and the two threads were tied separately.

The *punctum aureum* consisted in passing a gold wire under the spermatic cord and sac, and twisting it tight enough to close the latter, without injuring the former part. A leaden thread, or a strong waxed ligature was employed in the same way.

The severe operations now described must have been attended with danger enough, if they had been performed by skilful surgeons ; but they were generally practised by ignorant quacks and itinerant mountebanks, who, in moving about from place to place, after receiving their fee, left the patients to their fate. ARNAUD* saw a man die of hæmorrhage in a few hours after a charlatan had publicly removed a large rupture and the testicle. A travelling rupture-curer, mentioned by DIONIS,† used to feed his dog with the testicles which he had removed. The animal was posted under the bed or table, waiting for the *bonne bouche*, while the spectators were made to believe that these precious organs were carefully preserved.‡

That unprincipled men should be ready to sport with the lives of their fellow-creatures for a trifling gain, and that they should find others credulous and weak enough to entrust themselves in their hands, is not a matter of wonder. But we must be greatly surprised to see, that in modern times, the government of one of the most enlightened countries in Europe has allowed the itinerant rupture-curers to practise their enormities unrestrained. By a report§ presented to the Royal Society of Medicine in 1779, it appears that the intendant of Police of Paris had observed, that many individuals, who came under his inspection, previ-

* *Mémoires de chir.* tom. ii. p. 464.

† *Cours d'opérations*, p. 337.

‡ The author appears to consider, that this emasculating process is not objectionable in ecclesiastics, “ Les testicules sont des parties si nécessaires à l'homme, qu'on ne doit les ôter, que dans une nécessité très-pressante : c'est pourquoi on condamne ces sortes d'opérations comme contraires aux loix divines et humaines : elles seroient cependant excusables sur un religieux qui préféreroit la guérison d'une hernie à ses testicules qui lui doivent être inutiles, et il en tireroit pour lors deux avantages ; le premier c'est que ses organes ne le tourmenteroient plus ; et le second, c'est qu'il seroit guéri d'une fâcheuse maladie.”—*Cours d'Opérations*, p. 337.

§ *Rapport sur les inconvéniens de l'opération de castration faite pour obtenir la guérison radicale des hernies*, par POULLETIER DE LA SALLE, ANDRY, ET VICQ D'AZYR, in the *Histoire de la Société Royale de Médecine*, tom. i. p. 289.

ously to entering the military service, had been deprived of one or both testicles, by operators of this description. The Bishop of St. Papoul found that more than five hundred children had been castrated in his diocese: and more than two hundred had been mutilated at Breslaw. Castration was still occasionally practised in France when SABATIER published his treatise on the operations.*

Ligature of the sac practised by SCHMUCKER† and LANGENBECK. The celebrated Prussian surgeon, SCHMUCKER, has described and practised a method of operating for the radical cure, similar to one of the preceding processes. It consists in exposing the hernial sac by an incision through the scrotum; dissecting it carefully away from the integuments and spermatic vessels; opening it in order to push up the protruded parts; tying the neck as closely as possible to the abdominal ring, and then cutting off the remainder below the ligature. He practised this with success in two cases. DESAULT‡ cured a congenital bubonocoele at the Hôtel Dieu, by placing a ligature on the mouth of the sac.

LANGENBECK was led by his researches into the structure and arrangement of the peritoneum, and of the vaginal coverings of the testicle, to meditate on the radical cure of ruptures: he carried his views into execution, and has given the following statement of his method and its results. "I divide the integuments over the swelling, without pinching them up into a fold, clear the hernial sac, push back the prolapsed parts, and place a ligature on the neck of the sac close to the ring. The tightening of this ligature gives no pain. If the sac has been completely detached from all its connexions below the ligature, it perishes. If, on the contrary, it has been separated only to a sufficient extent for passing the ligature, and still remains connected to the scrotum below, it becomes inflamed, and the scrotum itself is affected with inflammatory enlargement, as after the radical operation for hydrocele. The detachment of the ligature occurs from the ninth to the fourteenth day.

"If the case is an external inguinal hernia, the sac must be separated from the spermatic cord. I detach it just below the ring, to a sufficient extent to allow the application

* 1796.

† Experiments on the radical cure of old scrotal ruptures by the ligature of the sac, in *Chirurg. Wahrnehm.* book ii. p. 236, et seq.

‡ *Recueil Périodique*, tom. ix. p. 290.

of the ligature, and leave the rest undisturbed in its situation. To separate the entire sac from the scrotum and from the tunica vaginalis propria testis, would cause too much irritation.

“The operation is much easier with small ruptures, which have not descended into the scrotum, and in internal inguinal herniæ, where the spermatic cord, with its tunica vaginalis communis, lying on the outer side of the swelling, is not so closely connected to the sac. It is the most easy in femoral herniæ, where the entire sac can be readily cleared. I have already performed this operation twelve times with the most successful results, and all the patients are capable of the hardest labour without wearing a truss. Two years have elapsed, since I first put my method in practice on a youth of sixteen with a large scrotal hernia, in whom there is at present no appearance of a new protrusion. A year ago I operated on a crural hernia in a female domestic, who does the hardest work without having experienced any return of her complaint.

“The ligature causes adhesive inflammation of the serous surface, and the neck of the sac becomes closed up to the abdomen, like the portion of an artery, which has been tied.”*

In the operation of SCHMUCKER, the patient encounters the risk inseparable from a wound of the peritoneum; and, both in his plan and in that of LANGENBECK the application of a ligature to the neck of the sac furnishes a continued source of irritation and inflammation, from which it will be fortunate if the patient escapes unhurt. The general objections to the performance of operations in reducible ruptures are applicable to these as well as to the other methods.

The proposal of DESAULT for the use of the ligature in umbilical hernia will be explained in the chapter on that subject.

The object of the proceedings above described was to close the mouth of the sac, and thereby to prevent a future protrusion. We may add, that, if the end was attainable in this way, any of the measures would probably be sufficient. But, in truth, something more is required; we want a remedy that should contract the tendinous opening: for while that remains preternaturally large, a new protru-

* *Bibliothek für die Chirurgie*, Band ii.; 1808; p. 727—9.

sion is a highly probable occurrence. A cure might be expected in recent cases, produced by violent exertion, or in young subjects; but in an old rupture, an old subject, or where the marks of predisposition are strong, there could be no hope. If the absence of an opening in the peritoneum were sufficient to prevent hernia, the complaint would never occur; as the membrane is entire previous to protrusion. When the ring has been dilated by the descent of the viscera, we cannot reasonably expect that the mere closing of the sac will form a sufficient obstacle to a fresh protrusion. This point is illustrated by the facts mentioned at pages 28 and 29, where we see that the conversion of the sac at its mouth into a contracted and thickened ring does not prevent a fresh descent of peritoneum; and that, even after the opening of the sac has become closed, a fresh protrusion often occurs by its side.

The insufficiency of the methods is tacitly acknowledged by the recommendation of wearing a bandage for some time afterwards. We find, that the herniæ often appeared again in those who had undergone the operation;* and we know, that a renewal of the protrusion is so frequent after the ordinary operation for incarcerated hernia, that the use of a truss is universally adopted, as a means of prevention. Since then the cause of the complaint, the enlarged state of the tendinous opening, is not removed by the processes adopted for a radical cure; since a recurrence of the disorder is not prevented, we may assert without hesitation that these operations do not afford any greater chance of complete relief than the employment of the truss.

Here we come to an important distinction between the two means. The latter is attended with no danger; it causes at most only inconvenience, which diminishes daily, and soon entirely ceases: while the former is highly dangerous, and has proved fatal in many instances. The result of our experience on this subject is contrary to what might have been expected. An operation, not considerable in itself, performed on a perfectly healthy subject, would seem at first view to carry with it but little risk. Let it be remembered, that the cavity of the peritoneum is laid open, and that the consequences of such an exposure are hazardous under any circumstances. We find

* ACREL operated in several cases of reducible hernia; some were radically cured, while the complaint returned in others. *Chirurgische Händelser*; see *Lond. Med. Journal*, vol. iii. p. 13.

from experience that the operation is at least as dangerous as that for strangulated hernia. ARNAUD* has recorded two cases of simple epiplocele, where the omentum could not be kept up, and the patients were thereby exposed to such inconvenience, as induced them to seek relief from the operation. They both died. SHARP† witnessed a similar termination in two or three patients who were strong and healthy before the operation. ACREL‡ lost a patient in the same way.

The experience of PETIT is still more decisive on the same point. The very candid manner, in which he states the unfortunate termination of his operations, is so honourable to him, that the reader will be pleased to read it in his own words. The extract will convey an important lesson. “Nothing can justify us in operating on a hernia but the strangulated condition of its contents. The following observations have made too strong an impression on my mind, to admit of my advising, or practising this measure, as the ancients did, merely with the view of procuring a radical cure. I recollect, with feelings of painful regret, that I have twice operated under these circumstances, and have seen the same practice followed three times by my colleagues; without reckoning several narratives which others have given to me of their experience. The first operation was performed on a young man of twenty-five. No precaution likely to ensure success was neglected; and the subsequent treatment appears to have been, in every respect, judicious. The patient died on the sixth day; inflammation had spread over the whole peritoneum, and its marks were particularly conspicuous on the stomach, intestines, and omentum. In a woman of the age of forty, with an entero-epiplocele of the size of a fist, very alarming symptoms followed the operation, and life was despaired of on the fifth day. She, however, afterwards recovered. The third operation was performed in the presence of PETIT. Its execution, and the subsequent treatment, were conducted, according to his representation, with all possible skill. Here death took place on the tenth day, from peritoneal inflammation.

“I am not the only person who has observed, that operations on unincarcerated herniæ are not so favourable as

* *Mem. de Chirurg.* ii, 453, 456.

† *Treatise on the Operations*, ed. x. p. 26.

‡ *Lond. Med. Journal*, vol. iii. p. 13.

those performed on incarcerated cases. Several of my brethren have made the same remark.”*

Mr. ABERNETHY operated in two cases, of which I subjoin the particulars, as they are calculated to afford a salutary caution against the repetition of similar experiments.†

“A healthy gentleman, about twenty-five years of age, was induced to submit to an operation for the return of an adherent omental hernia, rather in order to remove the inconvenience and apprehension which the disorder occasioned, than from any urgent necessity; for any increased exertion in walking or riding produced the descent of a portion of intestine behind the thickened omentum, and obliged him to stop and replace it, and he frequently could not accomplish the reduction without considerable difficulty. The application of trusses had been quite ineffectual in obviating these alarming inconveniences.”—“A portion of the omentum was cut off, and the remainder was returned after two vessels had been tied. The operation was followed by general disorder of the constitution, manifested by a full and strong pulse, furred tongue, great anxiety, restlessness, and total want of sleep. The stomach was particularly affected, being distended, uneasy on compression, and rejecting everything that was swallowed. He was bled largely in the evening, and took saline medicines, but could not be prevailed on to swallow anything else, except some toast-and-water. The disturbance of the circulation, with hot and dry skin, nausea, costiveness, sleeplessness, and anxiety, lasted for four days, when nature relieved herself by copious evacuations from the bowels, and the patient recovered. Although relief would probably have taken place sooner by a further loss of blood, either generally or locally, for which there was an obvious indication, the symptoms were serious and alarming, and life was endangered.”

Of the other case Mr. ABERNETHY says, “I performed a similar operation on a patient, whose life had been twice in imminent hazard from strangulation in a case of adherent epiplocele, in which a truss did not keep up the hernia. This operation was followed by violent peritonitis, which could only be subdued by such copious and repeated venesection, as endangered the patient’s life. These cases have

* *Traité des Mal. Chirurg.* tom. ii. p. 354—357.

† *Surgical Observations*; part ii. p. 5.

made such an impression on my mind, that I should be very averse in future to undertake similar experiments.”*

The subject of an incarcerated rupture submits to an operation in order to save his life. But he whose hernia is reducible, endangers his life to get rid of an inconvenience: and the operation affords no greater prospect of entire recovery than he had without it. For after he has undergone an operation at the hazard of life, the complaint may return; and the only protection against relapse is to wear a truss. All these considerations apply with the greater force in the present day, since the improvements in the construction of trusses have increased their efficacy and diminished the unpleasant effects of their application, so that they afford, with little inconvenience to the patient, not indeed a complete, but a great protection from the suffering and danger attendant on ruptures. The surgeons of former times might find an excuse, in the imperfection of their palliative means, for the hazardous measures by which they attempted a radical cure: and the serious evils arising from the unchecked increase of ruptures would naturally and reasonably lead the sufferers under such disorders to submit even to a hazardous mode of relief.† The prevalent, though entirely unfounded, belief, that these disorders are accompanied with a diminution of the sexual powers, would increase the desire of a complete cure, and provide, in an age when surgery was imperfectly cultivated, a constant source of imposition to the artifices of unprincipled persons.

Excitement of inflammation in the hernial sac by a tight truss.—RICHTER has hinted at the possibility of ob-

* *Ibid.* p. 11, note.

† The following statement concerning the Swiss peasantry presents a lively picture of the sufferings produced by ruptures where the means of relief are imperfect. “Sed miseri ob hunc affectum Helvetiorum ruricolæ considerandi nobis jam ulterius veniunt, qui herniis fidem fere humanam superantibus interdum premuntur: haud raro enim intestina vix non omnia in scrotum prolapsa adeo illud extendunt ut absque stupore ejusmodi hernia non possit aspicere. Membrum sæpe virile fere totaliter absconditur, ita ut non nisi foramen, per quod urina mittitur, de eo appareat; quandoque si in ejusmodi statu misero duris adhuc laboribus agitantur, facile $\tau\omega$ miserere vel strangulationi intestinum ansa subministratur. Adde quod etiam eo quo fruuntur victu excitentur tormina, arctæ insuper brachiorum ligaturæ illos arceant a laboribus, sudor quoque a fortiori nisu et labore affluens subligaculum madefaciat, unde insignes molestiæ ortum trahunt. Per madefactum enim subligaculum et fortiolem motum cutis inter laborandum insigniter atteritur, et exinde producta vulnuscula tam urenti, et acuto dolore eos excruciant, ut semper operationi se subicere, quam tantis doloribus obnoxii continuo vivere malint.” *Freytag in HALLER, Disp. Chir.* tom. iii. p. 70.

taining a radical cure in a short space of time, by the pressure of a tightly-applied truss. "Since inflamed parts contract adhesions when in contact, might we not," says he, "by means of the bandage, obtain in most cases a radical cure; employing it so as not only to compress the neck of the sac, but also to excite inflammation in the part? A truss with rather a hard pad should be employed for this purpose, drawn sufficiently tight to cause pain, and kept on until the pain is considerable, attention being paid to guard the spermatic cord. I think this would be the most easy and certain method of accomplishing a radical cure; and I have strong reasons for supposing that I have seen several individuals cured in this way." The immediate connexion of the hernial sac with the cavity of the abdomen, the facility with which inflammation spreads over continuous membranous surfaces, and our inability to limit its progress to the desired spot, are strong arguments against this proceeding. They expose the patient to a risk, which the desire of removing a mere inconvenience cannot justify.*

The proposal of DESAULT for the use of the ligature in umbilical hernia will be explained in the chapter on that subject: the propriety of operating on irreducible cases is considered in the next chapter; and the methods, which have been recommended to promote the radical cure, in the operation for incarcerated hernia, will be examined in the section on the operation.

RECENT PROPOSALS FOR THE RADICAL CURE OF RUPTURES.

Fresh attempts have been made recently to accomplish the radical cure of ruptures by means, some of which are dangerous, and therefore exposed to the objections already made to the older methods, while none have as yet been sufficiently sanctioned by experience to induce us to adopt them.

Plug of integuments introduced into the mouth of the sac by Dr. JAMESON.—I describe this singular proceeding in the words of the operator, as I find them in the LANCET,

* See the cases quoted in the preceding chapter, page 107, note, to show the danger of trusses which exert a strong pressure.

1828—9, Vol. ii. p. 142, extracted from the *American Medical Recorder*.

A young lady, who had been operated on for strangulated femoral hernia by Dr. G. JAMESON, of Baltimore, was disappointed and greatly distressed by the return of the swelling. As she was determined to get rid of the complaint by any means, however hazardous, Dr. JAMESON devised and executed the following proceeding, no other person being present except her maid. "The hair carefully shaved off the part, I made an incision through the skin and fatty structure down to the fascia of the thigh, a little to one side of the centre of the femoral aperture, and a little obliquely upwards, and a second incision beside it, by which I cut loose a lancet-shaped piece of integument, the widest part of which was fully three-fourths of an inch wide, and two inches in length. Its largest diameter upwards and downwards, and most of the tongue-like flap below the aperture; wide end down, and cut loose; the upper left attached to the skin over POUPART'S ligament, by which connexion this flap was to be sustained. The fascia being now cut, and the hernial tumour returned, the thick end of my flap was forced into the femoral aperture. Then the skin on either side was drawn over the flesh, and united by three or four sutures; this completed the operation." "Being without assistance, the sutures were not so well secured as I wished, and indeed I was much disappointed by the behaviour of my patient; her deportment was very different from that in the first operation. Vomiting and restlessness were troublesome for a day or two, and the outer skin did not heal in its whole extent by the first intention. Still it healed in considerable part, and the flap contracted into a hard knob over the aperture, and thus was it closed, so as to prevent return, to the best of my knowledge."

Method of M. GERDY.—"This consists, 1st, in pushing the skin, with the end of the finger, through the ring into the hernial canal, so as to invert a portion of it, as one may do with the finger of a glove; 2ndly, in fixing the extremity or fundus of this bag-like inverted process of integument, by three, four, or five points of suture, to the front of the hernial canal; 3rdly, in causing inflammation of this cutaneous bag by the application of ammonia, so as to produce inflammation of its sides and obliteration of the cavity;

4thly, in order to render the result more certain, in closing the external opening of the cutaneous process by sutures."

M. GERDY adds, that in the first patient, whom he operated on rather less than a month before, the adhesions had been complete on the seventh or eighth day, and that the patient at the time of writing was cured.*

A modification of this plan has been employed by M. SIGNORONI, professor of clinical surgery in the hospital of Padua, in two cases, which he has published in the "*Bullettino delle scienze mediche di Bologna*."† One of these was a man with large ventral hernia, strangulated. The return of the part was accomplished, and the patient was about to leave the hospital, when he mentioned that he could not keep up the rupture by any kind of bandage, and expressed a strong desire to obtain a cure, if it were possible. The parts came out through an opening as large as a dollar at the external edge of the left rectus abdominis above the iliac region. The following operation was performed in the presence of Professor LIPPICH and many pupils. After returning the viscera, the coverings of the tumour were pushed into the belly through the opening in the parietes, as we invert the finger of a glove. The situation of the rupture now presented a cul de sac instead of a swelling. The skin was maintained in this position by pressure with a female catheter. The operator then passed three long hare-lip pins, including all the parts external to the peritoneum, at the distance of four lines from each other, so as to bring together the sides of the opening, or, in other words, to reduce the circle, which formed the basis of the hollow process of skin into a linear slit. A waxed thread was then wound with moderate tightness round the pin, in the form of the letter 8. The parts were covered with compresses dipped in iced water; and the precautions necessary to prevent inflammation were adopted. This plan was followed for seven days, except that on the fourth day emollient poultices were substituted for the compresses, on account of some swelling in the portions of the skin which had been drawn together. The pins and threads were removed on the seventh day: the pricks of the former suppurated abundantly: but the union (*le récollement*) had already taken place; the parts drawn together by the

* *Lancette Française*; April, 1835.

† *Encyclografie des Sciences Médicales*; May 1837.

sutures had not moved, and the skin remained in its inverted state. The cutaneous process was gradually obliterated, and the part became smooth or like a kind of navel.

The second case was that of a youth of low stature and scrofulous constitution, twenty-six years of age, with two large reducible inguinal enteroceles. The rings were lax, and the skin could be easily pushed into them. Great inconvenience was experienced from the complaint, which rendered the patient incapable of active exertion. The operation, performed on the left side, was different from that in the preceding case. The surgeon introduced his finger into the inguinal canal, pushing the skin as far up as possible. He then made a longitudinal incision, of half an inch, at the external angle of the ring, so as to expose it. The finger was withdrawn from the canal and introduced into the wound, where it was intended to protect the spermatic cord, and prevent the parts from coming down again during the operation. The external and superior part of the inguinal canal was now slit up with the bistoury of POTT carried on before the finger. The skin was again inverted in the inguinal canal, and kept in that position by means of a female catheter. Two long hare-lip pins were now passed through the whole extent occupied by the catheter, so as to maintain the parts firmly in the described position, and to unite the sides of the inguinal canal to each other, and to the conical process of inverted integuments. The pins were placed horizontally and parallel to each other, at the distance of three lines, and traversed the whole thickness, both of the inverted parts and those which contained them. A waxed thread was then applied round them in the usual manner. They were taken out on the twentieth day, and the case was complete.

I cannot agree with the proposer in considering this proceeding harmless, or thinking it likely to be advantageous. The sutures, by which the inverted portion of the skin is to be fastened in its new situation, according to the plan of M. GERDY, and the hare-lip pins, as used by Professor SIGNORENI in his second case, must in all probability pass through the hernial sac. What can be more likely to produce peritoneal inflammation than these wounds of the membrane, and the irritation caused by the presence of the threads thus left in contact with it? I therefore concur entirely with MESSRS. LARREY and ROUX, to whom the

matter was referred by the Academy of Medicine, in the unfavourable opinion expressed in their report.*

Method of M. BELMAS.—"This surgeon pierces the coverings of the rupture, having previously returned the contents, with a curved canula, armed with a point at one end. The instrument is carried from without inwards at the lowest part of the swelling, or the point most distant from its neck, and enters the sac; the point is then conveyed as nearly as possible to the neck of the swelling, and brought out again from within outwards. An empty bag of fine goldbeater's skin is fixed to the other end of the canula. By drawing the latter, the bag is carried into the sac, as a needle brings a thread after it. The portion, to which the canula is fixed, is just drawn through the second wound, and the bag itself remains in the cavity of the sac. It is inflated by means of the canula, and left in the cavity of the rupture. Numerous experiments on living animals have shown M. BELMAS that bags of goldbeater's skin, introduced into serous cavities, become fixed, excite a secretion of lymph which traverses their sides, and combines with their tissue, becoming organised, and thus converting it into a solid substance. The views derived from such facts have been applied by this ingenious surgeon to the radical cure of ruptures; the organic substance, into which the bag of goldbeater's skin is converted, being well calculated to prevent reproduction of the disease.

"Of four cases, related in the memoir of M. BELMAS, where the plan had been tried in the human subject, one was an old inguinal hernia in a man of seventy-four; another, a youth of fourteen, afflicted with congenital inguinal hernia complicated with hydrocele; a third, umbilical hernia in a female of twenty-eight; the fourth, a man of fifty-seven, with hydrosarcocele; a fifth instance, since the publication of the memoir, was a double inguinal hernia in a man of sixty.

"The operation was successful, without unpleasant symptoms, only in the first case. The second patient had nearly sunk from severe inflammation following the operation; but he recovered. The third was cured, not however in the manner which constitutes the peculiarity of this treatment; for the indolence of the patient obliged M.

* June, 1835. *Encyclographie des Sciences Médicales*; tom. xxxvi. *Sociétés savantes*; p. 152.

BELMAS to withdraw the bag of goldbeater's skin at the end of a few hours."*

That we cannot wound the peritoneum, and place foreign substances in contact with it, without risk of serious and even fatal consequences, would be sufficiently proved by the facts just recited, if it were not already well known. The danger of this method seems to me more obvious than its ingenuity, which has been the subject of commendation. That it is capable of accomplishing the radical cure of ruptures remains to be proved.

Use of the seton and pins.—These two methods have been resorted to for the purpose of exciting in the hernial sac inflammation and effusion of lymph, in the expectation that adhesion of the sides, obliteration of the cavity, and radical cure of the complaint would follow. I have met with no records of cases, in which the seton has been used. M. A. BONNET, of Lyon, has described the other plan in the *Bulletin général de Thérapeutique*; May, 1836. He introduces three, four, or more pins through the integuments of the sac, and twists the point of the pin so as to be able to compress the included parts between it and the head. He takes care not to injure the spermatic cord. When he supposes that a sufficient degree of inflammation has been excited, that is, between the sixth and twelfth days, he removes the pins. He has employed this method in four cases of inguinal hernia, and found it easy of execution, unattended with pain, and apparently successful in reference to the intended object. It must be observed, however, in reference to the latter point, that he had not seen two of the patients after they had quitted the hospital. In two others, at the end of a month, the cure appeared permanent.

The employment of pressure by means of wooden blocks.—The application of considerable pressure over the mouth of the sac by means of wooden blocks, has lately been proposed and practised in the United States of America, with the view of procuring a radical cure of the complaint. The subject came under discussion in the Philadelphia Medical Society, which appointed a committee of its members to investigate it and report their observations and conclusions. These gentlemen made an elaborate and interest-

* *Dictionnaire de Médecine et de chirurgie pratiques*; article *Hernie*, par M. SANSON, tom. ix. p. 535. The method is also described by M. VELPEAU, *médecine opératoire*; tom. ii. p. 306—7.

ing report, which is published in the seventeenth volume of the *American Journal of the Medical Sciences*, under the title of *Report of the Committee of the Philadelphia Medical Society, appointed, December 27th, 1835, to investigate the character of STAGNER'S truss, and other proposed means of radical cure in Hernia*; with a plate containing figures of the blocks.

“It appears by current report, that the block of STAGNER originated in an accident. A man engaged in out-door occupations, found that his truss, a common and an old one, did not properly retain the bowel, owing to a defect in the pad. Unwilling, at the moment, to leave his labour, or unable to procure immediately another truss, he thrust a small piece of wood with an irregular surface, beneath the pad. The hernia was then retained, and he wore the apparatus for some time, with no other inconvenience than a soreness of the part. The man is said to be radically cured. The fact being circulated in his neighbourhood, blocks, in imitation of the pad, with its accompanying piece of wood, were applied in other cases, and, it is said, with success. From these attempts resulted the block of STAGNER.” It is a piece of wood nearly resembling the pad of a common truss; but it is smaller, acuminate at the extremity next the spring of the truss, and raised into a narrow and almost angular prominence on its convex surface, which is rendered rugose by the intersection of little planes (facets) produced by the knife in carving, and purposely left prominent.

The theory of the action of this block, in effecting the radical cure of hernia, as propounded by those who recommend its employment, is this: “An irritation of the skin and subcutaneous cellular tissue is produced by the pressure of the hard, unyielding and rugose block, and is gradually extended to the tendons beneath, as well as to the serous membrane of the sac, which is closed and obliterated in its neck; the whole mass of integuments, tendon, cellular tissue, and the sac being agglutinated by the process of adhesion, in such a manner as to oppose an insuperable barrier against the exit of the intestine.” The rugosity of STAGNER'S block was found to produce an irritation of the skin more severe and painful than appeared necessary for the creation of the mild inflammation thus hypothetically required for the accomplishment of the radical cure; hence the blocks are now made smooth.

They vary in form according to the kind of rupture ; and several modifications are described in the report and illustrated by the figures in the plate. I conclude that these wooden blocks supply the place of the pads in ordinary trusses, and that they are not applied separately. This specific point, however, is not alluded to in the report.

The committee saw several cases submitted to this mode of treatment, and observed their progress from time to time. These facts induced them to think favourably of the method, although the details, as published in the report, convey no clear and conclusive evidence of radical cure, nor in respect to the changes produced either in the neck of the sac or in the openings through which it passes. They “are decided in opinion that the retentive power of solid blocks exceeds, *cæteris paribus*, by considerable difference, that of pads composed of softer materials.” They also think that the chances of radical cure depend mainly on the retentive power of the apparatus employed ; and they have no hesitation in stating, that the action of these wooden blocks offers a better prospect of radical cure, even under unfavourable circumstances, than any apparatus previously offered to the public.

The pressure of the instrument sometimes produces bruising, ecchymosis, redness, swelling, soreness, or pain. These are temporary effects, which never proceed to any serious degree. The committee consider that there is no danger of general peritoneal inflammation when the treatment is directed by competent skill.

They have seen no evidence, in any instance, of induration or adhesion having been produced by the application of the blocks. They have observed, on the contrary, a “rapid absorption of the deposits in the subcutaneous cellular tissue, and sometimes in the dermoid tissue also, which permits the block to act almost immediately upon the tendinous canal, thus effectually closing the neck of the hernial sac, of which it very probably produces the obliteration. It is possible that the temporary security produced by this means, which very slightly opposes the formation of a new sac, has been a cause of deception with regard to certain cases, reported as radical cures, but which have been subjected to relapse.”

This American plan seems, at first view, to be merely

a modification of the *palliative* treatment by trusses, the pressure on the mouth of the sac being made by a piece of wood instead of an ordinary pad. We should not therefore be justified in classing it among the means of *radical* cure, unless it should be found by experience that the wooden blocks, either by their hardness, or the tightness with which they are applied, exert a much more decided influence than the common truss, in causing contraction of the tendinous opening and of the peritoneal process, and closure of the latter at its orifice by adhesion.

CHAPTER VII.

Treatment of Irreducible Ruptures.

WHEN the urinary bladder is drawn out of its place into a rupture, it is not surrounded by a process of peritoneum, as the parts are in ordinary cases, but a portion of its surface is fixed by cellular connexions in the new, as it was in the old situation; consequently the protrusion cannot be replaced. See the chapter on *Hernia of the Bladder*.

In an analogous manner, the cœcum and neighbouring part of the colon, and the sigmoid flexure of the intestine, sometimes descend through the abdominal ring, retaining their posterior and lateral cellular connexions, and being therefore incapable of reduction. See the chapter on the *Anatomy of Inguinal Ruptures*, SECT. 6; also CHAP. XI. SECT. 8.

The reduction of a rupture may be impracticable, although the protruded parts suffer no strangulation. Increased volume of the hernial contents, preternatural connexions of the parts to each other, or to the hernial sac, and membranous bands of adhesion crossing the cavity of the latter, are the causes which prevent reduction in these cases.

Thickening and enlargement of the mesentery and omentum are the most frequent circumstances under the first of these heads. In irreducible ruptures of long standing, much of the mesentery gradually passes into the sac; this part, as well as the omentum, is confined and constricted in the ring, but there is no obstacle to their augmentation below. The enlarged portion in the hernial sac, is connected to the sound parts in the abdomen, by a narrow process corresponding to the ring; and this conformation must be a great obstacle to reduction.

Adhesions of the parts proceed probably from occasional

irritation caused by the pressure of the ring ; and other accidental causes may assist, in a neglected rupture, in producing this effect. They assume various forms, and exist in very different degrees. Sometimes there are tolerably long and separate filaments ; sometimes the parts are united into one mass by a close and general connexion. The consistence of these adhesions is equally various. The protruded viscera may adhere to each other ; to any part of the hernial sac ; or to the testis, where they are contained in the tunica vaginalis.

Adhesions generally occur in old herniæ, which have been left to themselves, and seldom, if ever, returned. They may also exist in recent and small cases. The omentum contracts such connexions very readily, and more frequently than the intestines. Adhesions will probably take place in herniæ, which have been incarcerated, from the inflammation which they have experienced. In old and neglected ruptures we may expect adhesions as well as enlargement of the protruded viscera.

It is often difficult to determine whether adhesions are present, except from the obvious circumstance, that the tumour cannot be reduced. If the swelling can be replaced in part only, the existence of preternatural connexions is probable ; and it is still more strongly indicated, if the integuments or the testicle be drawn up towards the ring, when attempts at replacement are made.

The most certain, and, indeed, the only method of avoiding the formation of adhesions, is the early reduction and exact retention of the prolapsed parts, by means of a truss. This kind of precaution is more important in an omental hernia, for the reason above stated.

In the sac of an irreducible hernia, where the passage into the abdomen must have been prevented by adhesions, water has been known to accumulate in such a quantity as to cause pain, and other considerable symptoms, and to render an opening necessary for its evacuation.*

Mr. POTT was consulted by a young man twenty-five years of age, with a large indolent swelling of the scrotum, containing fluid ; the tumour being continued along the spermatic cord into the ring. He had been affected with rupture as long as he could remember, and had worn a

* MONRO, *Edinburgh Medical Essays*, vol. v. ; SCHMUCKER, *Vermischte Schriften*, book ii. p. 55.

steel truss, which he had left off for some time, having substituted a tight bandage without a spring. After he had worn this some time, he could not return the rupture, as he had been able to do previously; he experienced considerable pain, and the scrotum had enlarged. Mr. POTT punctured the swelling and let out above a pint of brown serum. In a year the fluid had collected again. An incision was then made, along the front of the swelling, from the groin downwards. The true nature of the case was now discovered; it turned out to be a congenital hernia, with a collection of fluid in the tunica vaginalis. "In the upper part or neck of the same bag, there was a considerable portion of omentum. The upper part of this portion of caul was hardened in its texture, and so perfectly adherent to every point of the neck of the sac, as to prohibit the return of even a fluid from thence into the belly; but the lower part was in its natural state, loose, soft, and capable of being expanded." The latter was cut off, the adherent portion being left in its situation, and the wound was filled with lint. The patient recovered.*

An irreducible hernia must be left in great measure to itself. Its bulk and gradual increase are sources of inconvenience, and the constant possibility of strangulation exposes the patient to considerable danger. The chance of incarceration is not, indeed, very great in these cases, since the ring is enlarged and weakened by its long distension; and the adhesion of the viscera, if it has occurred about the mouth of the sac, may prevent the introduction of a fresh part into the opening. Yet, experience proves that strangulation may occur, and that such swellings become gradually larger. For these reasons it has been proposed to open the sac, to destroy the adhesions, return the parts, and thereby produce a radical cure.

But, if this proceeding be not admissible in a case of reducible rupture, it is opposed by stronger arguments under the circumstances we are now considering. The danger of the operation is greater, as a large surface is exposed, and the adherent parts separated by the knife in a long and difficult dissection, must also go through the processes of inflammation and suppuration. Let it be further considered, that the parts contained in a large and old hernia cannot always be retained in the abdomen, from the dimi-

* *Works*; vol. ii. p. 415.

nished capacity of that cavity ; examples of which are related in the present chapter, as well as in the section which treats of the operation on large herniæ. Lastly, the occurrence of strangulation is not probable ; and, if it should appear, its progress is slow, and relief may be obtained by milder means.

An exception may, perhaps, be made to the general rule of not operating in irreducible herniæ, in behalf of those instances, where the tumour occasions such essential inconvenience and suffering to the patient, as induce him, when the dangers he incurs have been fully represented, to submit to the operation. Such was the case of the celebrated ZIMMERMANN.* The omentum adhered by a single filament to the testicle : when the former was replaced, the latter ascended with it, and experienced painful pressure from the ring : if the parts were allowed to protrude again, a portion of intestine generally followed, was pressed on by the ring, and occasioned a fear of strangulation. The pressure of a truss occasioned such severe suffering that it could not be borne. In a patient, on whom Mr. ABERNETHY † operated, an adherent epiplocele gave rise to frequent protrusions of the intestine, which were highly distressing. No operation ought, however, to be performed in such cases, until other safer measures have been tried and found ineffectual. The patient should first adopt the means described in the next paragraph. We need not despair of returning the rupture, even where adhesions exist : the adhesions may be stretched and elongated so as to allow the return of the parts, which may then be kept in place by a truss. The operation is only justifiable where great pain and inconvenience are experienced, and admit of no other remedy.

Surgical observers ‡ have recorded several cases, in which large, old, and irreducible ruptures, in consequence of long confinement to bed, have returned completely into the cavity of the abdomen. It has been proposed to imitate this operation of nature by the efforts of art, and the attempt has, in some instances, been attended with success. By confining the patient to bed, by restricting him to a light and sparing diet, and by the employment of vene-

* Related by MEKEL, *de morbo hernioso congenito, singulari*, &c. 8vo. Berol. 1772 ; and by SCHMUCKER, *Vermischte Schriften*, b. ii.

† *Surgical Observations*, part ii. p. 5. See *ante*, p. 120.

‡ FAB. HILDANUS, cent. v. obs. liv ; POTT's *Works*, vol. ii. p. 73.

section, calomel, purgatives, and clysters, ARNAUD * accomplished the replacement of a vast scrotal rupture, which had existed from infancy; and succeeded in numerous herniæ which resisted every other method. His assertions on this subject are corroborated by the testimony of LE DRAN,† who witnessed the progress of many of his cases. The same plan has been successful in several instances in the practice of MR. HEY.‡

By the employment of suspensory bandages progressively diminished, and the horizontal position, M. J. CLOQUET§ accomplished the replacement of a scrotal hernia of the right side, as large as a child's head of three months, containing the cœcum and some small intestine. The treatment occupied two months.

By confinement and low diet, Mr. EARLE accomplished the return of a large scrotal rupture supposed to contain omentum. The patient, twenty-eight years of age, ruptured himself two years before, while lifting a heavy weight. He felt something give way, and observed a swelling in the groin, which gradually descended into the scrotum. For two years he suffered no inconvenience from the complaint; the parts came down in the day, and returned at night. He never wore a truss. Three weeks before he came to the hospital he found that he could not reduce the rupture, which gradually increased in size, causing much uneasiness and pain. On his admission into the hospital, the scrotum was considerably distended with a hard inelastic substance, which was supposed to consist of omentum: the bowels were not constipated, but the rupture could not be replaced. The patient was put on low diet, and the recumbent posture was strictly enjoined. To take liq. potassæ mixture three times a-day; and, with the view of assisting the absorbents, mercurial ointment was directed to be rubbed on the surface, so as to produce slight ptyalism. The hardened omentum gradually softened and decreased in bulk, until it was entirely reduced. A truss was applied on October

* ARNAUD on *Hernia*, p. 292; also his *Mém. de Chirurg.* tom. ii. p. 476, 486, 498.

† *Traité des Operations*, p. 114.

‡ *Practical Obs.* p. 219.

§ *Rech. sur les Causes et l'Anat. &c.* p. 112, note.

24, and he left the hospital on the 27th, the treatment having commenced on September 17.*

A young man was admitted into the hospital, under my care, with strangulated inguinal hernia of the right side; the symptoms not being very urgent. The application of leeches, followed by that of evaporating lotions, aperients and clysters, greatly diminished the swelling, and relieved the bowels. An elongated swelling, rather thicker than the thumb, firm and freely moveable, remained in the groin, and could not be replaced. The patient stated that this was the habitual state of his complaint, for which he had never worn a truss. There could be little doubt that this tumour was a thickened portion of omentum. He was kept in bed, on low diet; cold was applied to the part, and active aperients were administered every second day. In the course of ten days the part was returned, so that a truss could be applied.

This treatment induces a general state of weakness and relaxation, particularly favourable to the return of the protruded parts; it must also operate powerfully, by causing the absorption of accumulated fat, in reducing the bulk of the hernial contents. For the latter reason we should expect it to be particularly successful in such ruptures as consist, for the most part, of omentum; and the recorded experience on this subject justifies our conclusion. In combination with the measures above described, considerable assistance may be derived from keeping up a constant pressure on the tumour, by means of a suspensory bandage, made to lace in front, and diminished in size, according as the contents of the swelling recede.† When the reduction

* *London Medical Gazette*, vol. v. p. 223.

† When the size of the tumour is not considerable, PÉTIT advises that its reduction should be attempted by means of trusses with hollow pads: and it appears from his representation, that these have been employed frequently in France with success. "Trusses designed for this purpose are not made with a common pad; but the latter part is excavated, and they are called 'bandages à cuillier'; in others, the part corresponding to the pad is a circle, triangle, or oval of thin steel: a piece of cloth covered with chamois, and more or less tense, is sewn to the inner border of this steel, and such are called 'brayers en raquette.' When instruments of this kind are used, they must be tightened from day to day, as the tumour diminishes, with great caution, the local effect, and the feelings of the patient being always regarded.

"It used to be stated as an axiom, that herniæ with adhesions could be reduced only by an operation: but since the management of hollow pads has been understood by surgeons, we have reduced and kept up several of

of the tumour has been effected, it must be kept up by the application of a truss.

In some instances, where the parts have been returned, the ultimate success of the plan has been frustrated by an unexpected occurrence. The parietes of the abdomen have become so far adapted to the diminished quantity of the viscera, that the sudden introduction of a large additional bulk could not be borne. A patient, who persisted for a long time, under the direction of SCHMUCKER,* in keeping the parts reduced, was brought into a state of the greatest extremity, which absolutely compelled him to remove the truss. This surgeon has seen many instances of the same kind; PETIT has even known the practice to prove fatal: the application of the truss after reduction caused nausea and vomiting, and other distressing symptoms, which rendered its removal necessary, yet the hernia did not come down again, nor did the symptoms cease; and the patient died, as it appeared upon dissection, from inflammation of the peritoneum.†

In the case of an irreducible omental hernia of moderate size, a truss with a hollow pad may be recommended, but an enterocele will not bear this treatment.

Sir A. COOPER has accomplished the reduction of herniæ, in some instances, after the previous application of ice to the swelling.

A person, who has a hernia incapable of reduction, is exposed to much greater danger than the subject of a reducible rupture. Strangulation may take place at any time, in consequence of some straining or exertion; and complaints arising from affection of the intestinal canal make their appearance on slight exciting causes: hence it is particularly incumbent on patients so circumstanced, to avoid all unusual efforts; and, by a strict attention to diet and the state of the fecal discharge, to keep the alimentary canal, as nearly as possible, in a healthy

these. Confinement to bed, and a strict regimen, are necessary parts of the plan."

He says, that when the intestine has passed up, in a mixed case, the omentum, if irreducible, becomes accustomed to the pressure, is diminished in size, hardened, and consolidated with the sac, so as to prevent future protrusion. *Tr. des Mal. Chirurg.* tom. ii. p. 335—346.

* *Chirurg. Wahrnehmungen*, vol. ii. p. 243. In two cases, where ARNAUD had returned large herniæ, vehement colic compelled him to remove the bandage, and let out the parts. They were afterwards replaced more gradually. *Mém. de Chirurg.* tom. ii. p. 495.

† *Tr. des Mal. Chirurg.* tom. ii. p. 392, 393.

condition. Costiveness should be particularly guarded against; by increasing the bulk of the contained parts, it increases the disposition to protrusion.

The use of a suspensory bandage will obviate some of the inconveniences arising from the swelling, by supporting it, and exerting a general pressure likely to prevent its enlargement.

Large and irreducible ruptures seldom become strangulated. The obstruction, when it occurs, is generally of that species which arises from accumulation of the intestinal contents; and the proper treatment will consist in the employment of moderate external pressure, purgatives, and clysters. The conduct which should be followed, if these means are ineffectual, is pointed out in the section “on the mode of operating on large herniæ.”

Irreducible ruptures must of course be exposed to all the consequences of external injury and violence; hence, various cases are recorded, in which the bowels have been burst by blows,* falls,† &c.

* COOPER, part ii. pref. p. 2. Laceration of the intestine and mesentery without any injury of the integuments.

A circular aperture in the ileum, with a ragged margin, of a size equal to the tube of a writing pen, caused by a violent blow on the pad of a truss. Fecal effusion into the abdomen, and death in forty-eight hours. Mr. TRAVERS'S *Inquiry into the Process of Nature, &c.* p. 37.

An opening in the ileum, six inches from its termination, large enough to admit the top of the little finger, from the kick of a horse. Death in eighteen hours. Mr. KEY, in *London Medical Gazette*; vol. i. p. 647.

Complete division of the small intestine, in an old bubonocoele, by the kick of a horse, followed by tympanitic enlargement of the rupture, and death in two days. JOBERT, *Traité des maladies chirurgicales du canal intestinal*; tom. i. p. 61.

† SIR A. COOPER, part ii. p. 47.

SCARPA has a case, in which a violent effort in turning the chain of a drawbridge, occasioned a hernia to be suddenly reproduced, which had been supposed cured for many years. The tumour was now very large and uniform. On opening it, gas and intestinal matters escaped. Four feet of ileum and a piece of colon were contained in the tunica vaginalis, and an opening of an inch in length was found in the latter. p. 310.

CHAPTER VIII.

Treatment of Strangulated Ruptures.

THE indication of cure in incarcerated hernia is to liberate the parts from stricture, and to replace them in their natural situation.* The treatment of the complaint, when examined in detail, will appear more complicated than this view of the subject would lead us to expect; for, as persons of every age and constitution, and of all ranks and conditions of life, are subject to the disorder, the means of accomplishing the general indication must be modified by these circumstances: hence we find, that various methods of treatment have been proposed, which, though very different, and sometimes almost opposite to each other, may yet be all of them eligible in particular cases: their respective merits may in general be estimated by the degree in which they contribute to the accomplishment of the above-mentioned object.

In every instance of strangulation, the surgeon either can or cannot determine the cause and particular species of the disorder: in the former case his treatment will be guided by the knowledge he has of the circumstances; while, in the latter, he follows general rules, and employs, without any particular indication, those means of which

* The propriety of establishing this, and this only, as the indication of cure for strangulated hernia, is so striking and obvious, that it would have been almost unnecessary to notice it here, had not RICHTER and CALLISEN, two of the most celebrated modern surgeons, represented the matter in a different light. The objects of surgical treatment in this disorder, according to these writers, are, to obviate inflammation; to subdue spasm; to procure evacuations; and lastly, to replace the rupture: thus they combat the effect while the cause continues to operate. The last is the only rational indication, and its accomplishment necessarily includes the attainment of the other objects.—See RICHTER *Anfangsgründe der Wundarzneykunst*, vol. v. p. 238. CALLISEN *Systema Chirurgiæ Hodiernæ, pars posterior*, p. 464.

experience has proved the efficacy. The last, or empirical method, is followed by most surgeons, who, in compliance with it, adopt measures which are often useful and proper, but which are also sometimes improper and injurious. That an attention to the cause and kind of the disorder is essentially necessary to a judicious and successful application of the curative means, must be obvious of itself: but frequently these points cannot be made out, and the surgeon perceives nothing more than the existence of the incarceration: here he must resort to the empirical treatment.

The principal means, which have been adopted for the cure of strangulated hernia, are bleeding; the warm bath; purgative medicines by the mouth, and in the form of clyster; injections of the infusion or smoke of tobacco; opiates and other antispasmodics; the cold bath, and various cold and warm applications to the part. The works of surgical writers afford numerous instances, in which all these methods have been successful; and the practice of most individuals would furnish similar results. But the recital of single cases tends, as Mr. HEY has well observed, to advance our knowledge very little: our object should be to ascertain the comparative merits of each mode, and to deduce from thence general rules of practice. With this view I shall consider separately what is to be said on each of the above-mentioned methods.

SECTION I.—THE TAXIS.

It is a general, but ought not to be an invariable rule, to attempt reduction by the hand, when we first see a strangulated rupture. Inflammation, tension, and pain, either in the part, or in the abdomen, may make it advisable for us in the first instance to bleed, use the warm bath, or apply cold locally.

The mode of proceeding is sufficiently described in CHAP. V. SECT. 1. As we may expect greater difficulty than with ruptures not strangulated, it is more particularly necessary to attend minutely to all circumstances, especi-

ally those of position and attitude, that are capable of influencing the result.

The inflamed and very sensible state of the parts makes it necessary for us to proceed gently and cautiously, to avoid forcible compression and rough handling, which not only aggravate the patient's sufferings, but, by increasing the inflammation, greatly augment his danger. Numerous instances are recorded, in which this unscientific roughness has produced the most injurious effects. Suppuration of the omentum,* and gangrene or rupture† of the intestine have been its more immediate or remote consequences: and the danger of the subsequent operation must be greatly increased if the attempts at reduction are ineffectual.

In the following case, mentioned by Sir A. COOPER, the patient was fortunate enough to recover after having the intestine burst in the attempt to return it. "A patient in GUY'S Hospital had an irreducible hernia, for the reduction of which a very considerable force was improperly used, when it suddenly gave way, but the tumour did not entirely disappear. In a week afterwards the part became very red and painful; a poultice was applied, when it broke, and a large quantity of bile, or rather of the contents of the small intestine, was discharged. This continued for several days, and afterwards gradually diminished, and the wound healed up entirely. Probably an adhesion had taken place between the ruptured intestine and the mouth of the sac, so as to prevent the effusion of bile from the bowel into the cavity of the abdomen, which would have produced fatal consequences."‡

The probability of success will be greater in proportion to the size of the opening: hence small tumours are the most difficult of reduction, as they are always attended with the closest stricture; and this difficulty is experienced particularly in crural ruptures, from the small dimensions

* ARNAUD, *Mem. de Chir.* tom. ii. p. 546.

† COOPER'S *Anatomy of Inguinal Hernia, &c.* p. 23; BELL, *System of Operative Surgery*, vol. i. pl. vii. and xi.; MORAND, *Opuscules de Chir.* tom. ii. p. 160; PETIT, *Tr. des Mal. Chir.* tom. ii. p. 328. "Combien de fois," says the latter writer, "a-t-on vu périr des malades le même jour que la réduction leur a été faite? a l'ouverture des cadavres, on a trouvé, aux uns le boyau gangréné, aux autres il étoit crevé, et les matières fécales répandues dans le ventre."

VELPEAU mentions two fatal cases, of the latter kind.—*Nouveaux élém. de med. operat.* tom. ii. p. 343.

‡ Part i. p. 31, ed. 2.

of the aperture through which their contents descend. The probability of replacement is also materially influenced by the duration of the complaint; it is much less in the later than in the earlier stages of the strangulation, from the inflammatory disorder which arises in the prolapsed parts.

When the rupture becomes very painful, we are no longer justified in continuing attempts at reduction by the hand. A sufficient pressure cannot now be endured; and the force, which is employed, only tends to increase the inflammation, and accelerate the approach of gangrene. At this period the operation is required, and should be performed without delay.

The surgeon is not warranted in relying on the taxis as his chief method of accomplishing reduction; he should not waste, in unavailing efforts of this kind, that time which ought to be devoted to the prosecution of more vigorous measures. When he cannot reduce a rupture at one fair trial, he has less and less chance of effecting this object in the subsequent progress of the case, unless he can produce an alteration in the state of the tumour by other means.

My opinion on this subject is confirmed by the experience of RICHTER, whose words I shall take the liberty of quoting.

“Je n’ai vu que très rarement une hernie vraiment incarcerated être réduite par le taxis, et lorsqu’on a pu la réduire, les circonstances avoient été tellement améliorées par d’autres moyens, et les parties rentrèrent si facilement et si inopinément, quoiqu’on eut fait auparavant des tentatives en vain, que j’ai penché toujours à croire qu’elles seroient rentrées d’elles mêmes quelques heures plus tard.”*

Mr. HEY† also advises us to be cautious of doing too much, as he has seen great harm arise from long-continued efforts to replace the strangulated intestine.

The opinion of RICHTER and of Mr. HEY receives the strongest confirmation from the experience and reasoning of DESAULT.‡ Long practice had shown that justly famous surgeon, that ruptures, in which the inflammatory symptoms are strongly marked, are seldom returned by the taxis, and that repeated and forcible attempts at reduction,§ em-

* *Traité des Hernies*, par ROUGEMONT, p. 66.

† *Practical Obs.* p. 144.

‡ *Œuvres Chirurgicales de DESAULT*, par BICHAT, tom. ii. p. 332—336.

§ Those, who have seen much hospital practice, will recognize the justice of the following remark. “Il en est des hernies étranglées comme de l’introduction des sondes dans les rétrécissemens de l’uretre; il faut, avant de recourir

ployed before the operation, have a decidedly unfavourable influence on the event of the case: hence he was led to proscribe the taxis in the inflammatory strangulation, until the previous use of other means had produced a change in the state of the swelling; and he justifies his conduct by the comparison of two lists of patients operated on at the Hôtel Dieu: in one of these were contained the names of patients, on whom reduction by the hand had been attempted, before the operation, in the usual manner; and, in the other, of those, who had been operated on without such attempts.*

The foregoing remarks are not intended to convey a general disapprobation of the use of the taxis. They are applicable to those cases only, in which the existence of considerable pain in the swelling and abdomen, together with other circumstances, denotes that the incarceration is of the inflammatory kind. Where the rupture is tolerably free from pain and tension, and the general character of the case is slow and languid, a judicious use of the taxis can never be injurious. And, although it is undoubtedly true, that the first attempt is the most likely to be successful, and that the hope of reduction diminishes as the strangulation continues, it does not follow that other trials should be proscribed. They may be renewed, when the means employed to promote the return appear to have made any favourable change in the tumour, or in the general condition of the patient.

Mr. WILMER,† of Coventry, has suggested a plan, which should be noticed in this place. He proposes to make pressure by means of a weight left on the part for several hours. It succeeded with him in two cases. A two-pound leaden weight was employed in one of these, and a common smoothing iron in the other. If the swelling were

aux derniers moyens, que chacun se soit épuisé en secours préliminaires; il faut que l'effort de tous les consultants passe, pour ainsi dire, sur la tumeur: s'ils sont nombreux, est-il possible qu'elle ne soit pas meurtrie, déchirée, surtout si, comme il arrive, chacun cherche à l'envi à obtenir, à force de pressions ce à quoi n'a pu réussir celui qui l'a précédé?"—p. 336.

* The remarks of PETIT on this subject coincide with those of DESAULT.

"Il-y-a des gens qui veulent réussir, et qui se vantent même de les réduire toutes: malheureux les pauvres malades qui tombent entre leurs mains; ils compriment trop l'intestin, la meurtrissure qu'ils y font, devient quelquefois mortelle par l'inflammation et la gangrene qui y surviennent. J'ai été plus d'une fois appelé en pareil cas, et j'ai fait avec répugnance des opérations aux malades sur qui l'on avoit fait de pareilles tentatives."—*Tr. de Mal. Chir.* tom. ii. 327, 328.

† *Practical Obs. on Herniæ*, ed. ii. case 1 and 2.

free from pain, and the circumstances not urgent, there could be no objection to a trial of this method.

Prolonged employment of the taxis.—Some surgeons place more reliance on the efficacy of the taxis, but ascribe its frequent failure to the ineffective mode of its employment; they recommend that a greater force should be applied, and that it should be persevered in for a longer time than has been usually done. Mr. G. MACLEOD, of Glasgow, informs us that he was called to a patient with a scrotal hernia, which had been irreducible for several hours. He says, “I determined on giving the taxis a very full trial, actuated in this, partly from having witnessed the most insignificant fingering called by that name, and partly from analogical reasoning. Cold applications were used for a short time, after which I proceeded to compress the tumour with both hands, and continued to do so, keeping up a steady pressure with little or no remission, for nearly half-an-hour; at length a gurgling noise was perceived under the hands, and the protruded parts slipped into the abdomen.” “This case made on me a lasting impression. The force used was very great, as well as the length of time during which it was applied. The sufferings of the patient, while under the operation, were inconsiderable, and immediately after it they were all gone. Following up this most important fact, I have ever since pursued a similar mode of treatment, and my success has been more than equal to my most sanguine expectations. During these last twenty-two years, twenty cases have fallen into my hands, and complete success has crowned my efforts in all of them, with the exception of one case, where the intestine adhered to the sac, and where the complete return of the protruded parts was impossible. The method pursued by me is very simple. The patient is placed on his back, his knees elevated so as to relax the muscles as much as possible; the tumour is grasped at its greatest diameter by the right hand, whilst with the left the neck of the tumour is firmly supported and compressed. This last part of the operation, performed by the left hand, I deem of the utmost importance; it prevents the tumour from spreading out in a lateral direction, and consequently prevents it from doubling up over the external ring. The compression then is to be kept up by the right hand in a steady and gradually increasing manner, and not performed by jerks. If the strangulation have existed for several hours, the opera-

tion will seldom succeed in a shorter space of time than fifteen minutes, and in large herniæ a much longer space is often required; I have in such cases continued the compression from one to two hours. The difficulty of replacing parts when the tumour is very large, appears to arise from the difficulty of grasping the tumour, and consequently the additional assistance of one or both hands of another person becomes necessary."

Mr. MACLEOD mentions the case of a female afflicted with an *inguinal* hernia, as we must suppose, though this point is not specified, of so unusual a magnitude that it reached to within a hand's-breadth of the knee. Not being able to replace it, he administered an enema of tobacco, made by infusing a drachm of the leaf in twelve ounces of hot water. Under the nausea and retching produced by this remedy, he succeeded in returning the parts. On another occasion he employed, for the same patient, first the tobacco-enema, and then the taxis. When the parts had been replaced, the opening was so large, that the points of three fingers could be pushed into it. He adds, "she recovered rapidly from this attack; indeed, I believe she experienced less inconvenience from that operation than did the operators, for I must confess that my hands ached and were tremulous for two days afterwards." In another case of very large scrotal hernia, the attempts at reduction, which were ineffectual in the first instance, succeeded after the tobacco-injection. Some years after, the patient was again in the same state, the tumour being of a much larger size, and extending almost to the knee-joint, so that it could not be grasped by two hands. "After the tobacco-glyster had been administered, Mr. HOOD, with the assistance of two carters, applied compression to the tumour, whilst I applied pressure to its neck. A full hour was expended under the most unremitting exertions of the four individuals already mentioned, before the displacement was overcome, and yet our patient recovered without a bad symptom."*

It appears to me that in the cases above mentioned the ruptures were not strangulated, but rather obstructed or simply irreducible; at least no mention is made in either case of the usual symptoms of strangulation, which does not occur frequently in herniæ of such magnitude, where

* Remarks on the cure of strangulated inguinal hernia by the taxis. *London Medical Gazette*; vol. vii. p. 264.

the opening into the abdomen is usually ample. In these immense protrusions, in which the ordinary operation would be almost certainly fatal, and the only admissible operative proceeding would be the incision of the stricture without opening the sac, active purgatives, tobacco glysters, and the taxis, are undoubtedly the proper measures.

The return of the parts, in Mr. MACLEOD's cases, seems referable as much to the tobacco as to the taxis. In herniæ of this kind the latter measure may be employed with more perseverance and greater force, than in the ordinary description of strangulated ruptures, to which I am convinced that this mode of proceeding could not be generally applied without great danger.

Long-continued perseverance in the attempts at reduction, with pressure gradually increased so as to amount at last to the employment of considerable force, has been strongly recommended by M. AMUSSAT of the Hôpital Cochin, as capable of accomplishing return in almost all cases. He goes to work without previous bleeding or use of the bath. The patient is placed on a bed formed into an inclined surface, of which the higher part is occupied by the pelvis, the lower by the chest: the head is a little raised by means of a pillow. The knees and feet are separated and drawn up as in the operation of lithotomy. The swelling is then surrounded by the fingers and gradually pressed; the pressure is sustained and increased; the swelling is drawn forwards, moved from side to side, pressed and kneaded in various directions; pushed towards the abdomen, and not quitted till it has completely gone up. If the hand of the operator becomes tired, he is assisted by another person, who places his fingers on those of the operator, and acts in concert with him. M. AMUSSAT perseveres in these attempts for several hours, and does not quit the patient, until he has completely reduced the prolapsed parts and the sac.*

The long-continued employment of force so considerable as that described by M. AMUSSAT seems to me highly objectionable in many cases, and hardly safe under any circumstances. The danger will be less in large and old ruptures, and such as are merely obstructed, than in cases of strangulation. It may therefore be resorted to in the for-

* *Journal des connaissances médicales*; Janvier, 1834. *Bulletin général de thérapeutique*; Decembre, 1835.

mer under due caution in respect to the degree of force, and the length of time it is persevered in. Can we doubt that such force would bruise the protruded parts, and thus increase the inflammatory disturbance, under which they already labour? That it might very probably burst a distended intestine, of which the coats may be already thinned and even ulcerated by the pressure of the stricture? Can we admit the principle on which this violent course of proceeding is founded, namely, that it is possible to push up all hernial protrusions, in opposition to the fact, which must be known to all who have operated in strangulated ruptures, that even when the sac has been opened, and we thus can grasp the protruded parts immediately, we cannot reduce them until we have liberated them from the pressure of the stricture?

If the reduction of ruptures in a mass, sac and all, were easy or practicable, the plan of forcible and prolonged attempts at reduction recommended by M. AMÉSSAT seems well calculated to accomplish it. This subject has been adverted to in CHAPTER V. SECT. 1, and will be considered further in the next section of the present chapter.

The question respecting the return of the sac will be considered in CHAPTER XI. SECT. 4. I consider this return totally impracticable in the great majority of ruptures; and I doubt whether it would benefit the patient if it could be accomplished.

SECTION II.—TREATMENT AFTER REDUCTION.

THE patient is not to be considered as free from danger, even when the rupture has been reduced. Generally, indeed, the symptoms are immediately relieved, and complete recovery speedily follows. But the cause of the strangulation may be of such a nature, that the reduction does not affect it; and its continued operation is indicated by other effects, although it no longer produces incarceration. The patient may suffer under symptoms produced by the strangulation; as, for instance, inflammation of the bowels,

which may be apprehended particularly when the incarceration has lasted long, and has been violent. Or the complaint may have been inflammation of the parts in the hernia, and then the situation only of the affected organs is changed.

If the strangulation has been caused by any disorder of the bowels, the mere replacement of the prolapsed parts cannot be expected to restore the patient to health. Even under other circumstances, the existence of the obstruction is a source of irritation to the intestinal canal, which cannot with safety be overlooked by the surgeon. The symptoms will not entirely disappear, until evacuations per anum have occurred; and these in general do not take place spontaneously. The bowels are irritated and oppressed by the accumulation of their contents consequent on the obstruction. Hence mild purgatives, such as sulphate of magnesia in small doses, and clysters, should be ordered soon after the reduction, and repeated at proper intervals, until the whole collection is cleared away.* This conduct will be more particularly necessary if the strangulation appears to have arisen from accumulation of the intestinal contents. The quantity discharged from the bowels in such cases sometimes appears to us enormous.

Where inflammation has been excited, previously to reduction, the effect will not cease, on the removal of its mechanical cause.† A continuation of the symptoms of strangulation, together with those which indicate inflammation in the abdomen, will then require bleeding, and the other antiphlogistic treatment, until these alarming appearances are removed.

It is possible that the rupture may not be completely reduced; a small portion of intestine may be still included in the stricture. If this keeps up the symptoms, and is irreducible, the operation becomes necessary.

* RICHTER has been surprised at the prodigious quantity of alvine discharges, produced by the action of purgatives, after the reduction of a strangulated hernia; and he believes that a species of gastric fever follows violent strangulation. He has seen, under such circumstances, a true bilious fever, continuing for several days, and removed by the repeated employment of purgatives. He warns us against confounding a feverish affection of this kind with the effects of inflamed bowels; since bleeding, and the other means necessary in the latter case, would only aggravate the evil in the former.—*Tr. des Her.* p. 68.

† Death has occurred from peritoneal inflammation, in a case where an inguinal hernia had been returned without any delay.—CAMPERI, *Icones Hern.* p. 3.

An inguinal hernia pushed through the external ring, and apparently reduced, might be still in the inguinal canal, and strangulated at the inner ring. Mr. MACILWAIN has recorded the following interesting example of this occurrence.

“I was sent for by a gentleman to see his servant, who gave me the following account:—that he had a rupture, and that finding himself unwell, he had sent for a surgeon, who had examined the tumour, and left him, saying that the rupture had gone up. Not finding his symptoms relieved, he had sent for me. I found him walking about the house, and endeavouring to follow his employment. On examining the abdominal ring, I found a small inguinal hernia, which readily receded on pressure; but as he had all the symptoms of strangulation in a well-marked degree, I examined him more particularly, and on thrusting the point of my finger into the ring, distinctly felt that the intestine only receded within this external opening of the inguinal canal, beyond which I could not reduce it by position or otherwise. I ordered him to bed, and immediately instituted the usual measures for the reduction of strangulated hernia; all these were employed without effect, with the exception of the tobacco-enema, which was administered about eight o'clock in the evening. I remained with him a short time after its exhibition; he felt very faint, and his pulse faltered considerably, but the hernia remained unaltered. I then left him for an hour, in order that he might recover from the effects of the tobacco, and then visited him with the intention of operating. I found him now expressing himself greatly relieved; he had had no further sickness; and, on examining the ring as before, no hernia was perceptible. In less than another hour, he had an evacuation from the bowels, and in two days felt perfectly well. I may observe, that Mr. STANLEY saw this case with me, and that there existed no difference of opinion between us respecting it.”*

A strangulation of the bowels, when returned, has been caused by preternatural adhesion, or uncommon conformations of the omentum. These occurrences are rare, and cannot be discovered during the patient's life.

The thickened and indurated neck of the hernial sac may keep up strangulation when the rupture has been re-

* *Surgical Observations*; p. 255.

turned in a mass, as described at page 92. The case quoted from LE DRAN, in that page, exemplifies this occurrence. Another instance is mentioned by SCARPA:* "I saw," says he, "this happen very lately in a boy thirteen years of age, in whom all the symptoms of incarcerated hernia continued, although it had been completely reduced, as far as could be judged from the sight and touch. And in fact, in the dead body of this boy there was not externally the smallest appearance of tumour in the inguinal region. But on opening the abdomen, it was immediately discovered, that the intestine, still strangulated by the neck of the hernial sac, had been pushed up along with the sac beyond the ring, where it was seen rolled up between the aponeurotic parietes of the abdomen and the great sac of the peritoneum."

The best course of proceeding, under such circumstances, would be that followed by SABATIER in a case which he has recorded in his *Médecine Opératoire*.† He had reduced an inguinal hernia, but the symptoms still continued. "The ring was so large, that I could push two fingers into it from without, and thus was enabled to feel a roundish tumour at considerable depth. I concluded that there must be internal strangulation, and that the only hope of saving the patient was by the operation, if I could succeed in bringing down the rupture again. I made the patient get up, and forcibly blow his nose, when the rupture re-appeared, and I operated. The sac was thickened and contracted in the situation of the ring, and I divided it without cutting the latter. The case was of the congenital kind, and the patient recovered."

If the strangulation should continue in a case of this kind, and the rupture could not be reprotruded by the patient's efforts, death must ensue, unless relief could be afforded by operation. If a swelling could be distinctly felt, either on thrusting the finger into the ring, or through the abdominal parietes in the inguinal region, would it not be justifiable to cut down on the part, to divide the aponeurosis of the external oblique, and ascertain whether the cause of stricture could be removed?

A very interesting case, in which the patient owed his recovery, under circumstances that would ordinarily have been deemed desperate, to the sagacity and judgment of

* *Sull'ernie*; 2nd. ed. p. 49. English translation; p. 143.

† Ed. ii. tom. ii. p. 342.

M. DUPUYTREN, is related by Dr. BRESCHET,* and will serve to illustrate the preceding remarks. A crural hernia, which had existed in a reducible state for twenty-eight years, became strangulated, and the man was brought to the Hôtel Dieu on the fourth day of the strangulation. In the bend of the thigh was a firm irregular tumour, as large as a hen's egg, extremely painful, and strongly bound down by the crural arch. In the course of the day the rupture went up suddenly, and with noise, but all the symptoms of strangulation continued, and the patient would not consent to an operation till the twelfth day. The anterior orifice of the crural canal having been exposed by a vertical incision, M. DUPUYTREN introduced his finger, and felt, at the depth of two inches behind the ring, a rounded elastic body, to which the patient referred as the seat of his sufferings. He pulled it by the cellular substance on its exterior surface, the patient at the same time coughing: thus a greyish white swelling, of irregular surface, was brought below the crural arch. A bloody fluid spirted out some inches when the sac was punctured, and the enlargement of the opening disclosed an intestinal convolution of reddish brown colour. The sac was now drawn down, so as to bring its neck on a level with the crural ring, and to enable the operator to divide the contracted circle, which had confined the parts. Stools passed in twenty minutes after the replacement of the bowel; and the recovery was rapid and complete.

M. DUPUYTREN pursued a similar conduct in two other cases; but, as each of these patients had two herniæ reduced, and could not distinguish on which side the pain was greatest, he was obliged to operate on both sides.† The particulars of these cases are not mentioned.

In the article *Hernie* of the *Dictionnaire de Médecine et de Chirurgie pratiques*, M. SANSON has given a more detailed account of the experience and practice of DUPUYTREN on this subject, the result of which has been remarkably successful. "M. DUPUYTREN has observed six cases of this kind. In two the efforts which he caused the patients to make, brought the swelling down again in a mass, as it had gone up, and the operation was performed in the usual manner. The tumour could not be brought out

* *Considérations sur la hernie fémorale* in his *CONCOURS*, &c. Obs. xx. p. 101.

† *Ibid.* p. 102.

again in the four others: in two of these, where there was hernia on one side only, an incision was made over the ring, which enabled the operator to seize the swelling and draw it down, when the operation was completed. In the two others there was a hernia on each side; both had been returned, and it could not be determined which of them had been strangulated. On one of these the operation was performed on the side where there was no strangulation: it was then repeated on the other side, the tumour was drawn out, and the operation finished. In the other, the operation was fortunately performed at first on the side where the strangulation existed.”*

Some caution must be observed in proceeding to perform an operation of this kind. “The symptoms,” says M. SANSON, “indicating that a rupture has been returned in a mass, are not always clear. Sometimes no swelling can be felt by introducing the finger into the ring, or placing the hand on the abdomen. Three years ago, a patient who had been treated in a medical ward for peritonitis, having represented that his illness had been preceded by some symptoms of strangulation in a hernia, which he had proceeded to reduce himself, was transferred to my care. He was in a desperate state, and died in a few hours. I had previously examined with great care the neighbourhood of the inguinal ring; but could discover no tumour. When the body was opened, I found that the fundus of the sac, which had been completely reduced, had passed between the pubes and the bladder.”

Another case, which occurred in the practice of M. SANSON, shows how necessary it is to proceed with deliberation under these circumstances. A patient, thirty-nine years of age, who had been a soldier, and had come to Paris from the country, was seized with violent colic, constipation, and vomiting, first of bilious, and subsequently of stercoraceous matters. When asked if he had a rupture, he answered in the negative. At the end of five days, during which the symptoms had become aggravated, the abdomen being enlarged and acutely sensitive to pressure, the patient being again interrogated, acknowledged that he had been affected with hernia for many years, and that he had, with some difficulty, returned it shortly before his illness commenced. Nothing could be discovered on examining the ring and its

* Tom. ix. p. 590.

neighbourhood: nor were the efforts made by the patient with the view of bringing the swelling down again, attended with success. At the end of thirteen days it was determined in consultation to cut down upon the ring and seek for the rupture, to which the symptoms were ascribed. On again examining the abdomen, a firm column was felt descending on the left side towards the iliac fossa, and lost in the pelvis. This turned out to be a depôt of hardened fæces which were brought away by injections and frictions, principally by oily clysters, the effect of which was aided by blistering the thighs, and applying a few drops of croton oil to the denuded skin. When the passage was cleared, an enormous quantity of soft fecal matter was discharged by stool for several days, and the symptoms subsided. The hernia reappeared spontaneously; it was soft, but irreducible.*

SECTION III.—BLOOD-LETTING.

THE use of blood-letting in strangulated hernia has been freely adopted, and warmly recommended by the most celebrated modern surgeons. The propriety of this practice is derived from the state of inflammation, which occurs sooner or later in the prolapsed parts, and is propagated from that source over the whole abdomen. We employ it, not only on account of its effects in preventing or removing inflammation, but because the state of faintness, which it produces, by diminishing the bulk of the protrusion, is peculiarly favourable to its reduction. Mr. POTT,† in this country, has been the most strenuous advocate of venesection in the treatment of strangulated hernia; and the high estimation in which his writings are deservedly held has been a chief cause of its general employment.

* *Ibid.* p. 572.

† “Perhaps there is no disease affecting the human body, in which bleeding is found more immediately and eminently serviceable than in this; and which, therefore, if there are no particular circumstances in the constitution prohibiting it, ought never to be omitted; but, on the contrary, should be freely and largely repeated, if it appears at all necessary.”—POTT’s *Works*, vol. ii. p. 79. SHARP’s advice on this subject is just the same. *Treatise on the Operations*, edit. x. p. 17.

RICHTER* and CALLISEN,† the authors of the most approved continental systems of surgery, have been no less forward in recommending the free and almost indiscriminate use of the lancet in this complaint. Yet the authority of these great names has not gained universal assent to their opinions. Some eminent surgeons of this country have not only doubted the utility of venesection in strangulated hernia, but have published opinions most decidedly adverse to the practice. Mr. WILMER‡ of Coventry, and Mr. ALANSON of Liverpool, consider bleeding as completely inefficacious in forwarding reduction. The former ascribes the death of the patient, in cases of strangulated hernia, to the immediate diminution of the powers of life by the inverted peristaltic action; and he thinks that large and repeated bleedings must increase the debility, and do much mischief. He considers that bleeding is extremely unfavourable to the patient's recovery, in case the operation should afterwards be performed: and he attributes the want of success in the treatment of cases brought into public hospitals, to their having been bled largely.

Mr. ALANSON adopts the opinions of Mr. WILMER on this subject. He states that bleeding to faintness had been the constant practice at Liverpool: "as soon as the deliquium happened, the taxis was tried during that stage; but I never saw this method successful, nor do I think bleeding ever of the smallest service in forwarding reduction."§

Sir ASTLEY COOPER,|| in speaking of venesection in the treatment of this complaint, recommends that when it is employed it should be carried to the extent of producing faintness. He adds, "the patient scarcely ever fails to express feeling much less pain after the bleeding and the warm-bath than before, at the same time that it too often happens that no advantage is gained in the essential point of reduction." He considers the tobacco-glyster and the application of cold to be more efficacious than venesection.

* "Aussitôt que la hernie est douloureuse, il faut saigner, de quelque espèce que soit l'étranglement." RICHTER, *Traité des Hernies*, p. 93.

† "Præcipuus vero cardo vertitur in sanguinis detractio: quæ non solum inflammationi obstat, et inde eo magis necessaria est, quo distinctiora phlogoseos symptomata adsunt, sed quoque ob citam, quam inducit, debilitatem, reductioni favet." CALLISEN, *Syst. Chir. Hodiern. pars poster.*, sect. 707.

‡ See his *Practical Observations on Hernia, illustrated with cases*, ed. ii.

§ See a letter to Mr. WILMER in the work last quoted, p. 29.

|| *Anatomy, &c. of Inguinal Hernia*, edit. ii. p. 33.

The question respecting the advantages and propriety of venesection in the treatment of strangulated hernia, like all other practical points, must be determined by experience. If it should be found useful, we may safely neglect the theoretical objections to its employment. We may admit with Mr. WILMER that the powers of life sink rapidly under the inverted peristaltic action which attends the advanced stage of strangulated hernia, as well as of peritonitis and enteritis induced by other causes. But the advantage of bleeding in either case consists in its contributing to prevent or remove the inflammation, which is the source of that inverted action. To represent that patients, who perish from strangulated hernia, either without operation or after its performance, die from debility, is to confound cause and effect. If bleeding is injurious in strangulated hernia, it must be equally so in other inflammations of the peritoneum and intestines, for the symptoms are the same in both cases, and examination after death discloses in both the same morbid changes.

The abstraction of blood in strangulated hernia, under such conditions and restrictions in respect to the age, constitution, and powers of the patient, and the period of the malady, as regulate its employment in other inflammatory complaints, is unequivocally beneficial, according to my experience, in promoting the return of the protruded parts, in preventing or checking the inflammatory disorder, which arises sooner or later in the progress of the malady, and in favouring the recovery of the patient when an operation becomes subsequently necessary. If carried so far as to cause fainting, it sometimes produces such a change in the state of the rupture, probably a diminution of bulk in the protruded parts by emptying the capillary vessels, that we can return it with ease. It is of no use to reason, in opposition to these facts, that venesection cannot enlarge the opening, through which the hernial contents have descended, that it cannot lessen the size of the prolapsed parts; and that it cannot excite any action of the viscera, which might extricate them from the stricture.

The indiscriminate use of venesection in strangulated hernia, like that of other remedies, whether in this or in other diseases, cannot be recommended; no judicious practitioner would think of resorting to large and repeated bleedings, in all cases, and in all stages of the affection; and it would be particularly injurious to persevere in de-

pletion at an advanced period of the complaint, when its earlier employment has been ineffectual, and no hope of relief remains except from the operation.

It is undoubtedly true that abstraction of blood often fails in accomplishing the desired object; and the same remark is applicable to all other measures: it is still beneficial by lessening the severity of the symptoms and checking the progress of the complaint. When patients die with strangulation unrelieved, or after the performance of an operation, we almost invariably find unequivocal evidences of peritonitis or enteritis; and the symptoms, supervening on operations, which we find it most difficult to combat, are of the same character. Hence a judicious use of venesection, at a proper period of the complaint, even if it does not enable us to return the parts, cannot be injurious.

The advocates and opponents of blood-letting have perhaps stated their opposite opinions too strongly; and a prudent practitioner will take a middle course. He will not, with POTT, use venesection in all instances; such a course, indeed, is not recommended by that great surgeon, as will be apparent from the passage already quoted; still less will he follow Mr. WILMER in discarding it entirely from the treatment of hernia; but he will restrict its employment to a certain class of cases.

He will have recourse to it when the strangulation is of the inflammatory kind; when the hernia is small and recent; the abdomen tense and painful; and the patient young, strong, and plethoric. The two following cases, related in the excellent *Practical Observations* of Mr. HEY,* will serve to show under what circumstances venesection is advantageous. The experience of this judicious practitioner leads him to concur with Messrs. WILMER and ALANSON in declaring, that blood-letting has frequently failed to procure the return of a strangulated intestine, although he does not agree with them in their general reprobation of its employment.

“CASE I.—I visited, in the evening, WILLIAM PRATT, of Bramley, a stout young man, whom I found labouring under a strangulated hernia. The strangulation had subsisted about seven hours; during which time he had drunk about half a pint of gin, diluted with water, apprehending his complaint to be the colic. He vomited frequently,

* Edit. ii. p. 110.

and had a full, strong, and frequent pulse. He could scarcely suffer me to handle the tumour, though there was no external appearance of inflammation. There was no tension of the abdomen. I opened a vein in each arm; and took away, in a speedy manner, betwixt twenty and twenty-four ounces of blood, while he sat upright in bed. He felt himself immediately relieved: and when I examined the groin, after tying up his arms, the hernia had retired.

“CASE II.—WILLIAM RENTON, porter to the general infirmary at Leeds, arose about two in the morning to assist the chimney-sweepers; but became so ill with pain at his stomach and sickness, that he was obliged to go to bed again at five. He continued all day to complain of much uneasiness at his stomach; and vomited up everything that he took. I happened to be at the infirmary in the evening, and visited him. The late Dr. CROWTHER had prescribed for him a solution of Epsom salt, but it was constantly rejected. Knowing that he was subject to a hernia, I inquired if it was now prolapsed. He seemed at first not to have thought about it; but upon my examination, he acknowledged that it had been down all the day, though he had no pain in the tumour. I ordered him to sit up in bed, while about a pint of blood was drawn by opening a vein in each arm at the same time. He became sick before the evacuation was finished, but had no delirium. Immediately after the bleeding, I placed him in a horizontal position, and tried to reduce the intestine, which now went up very readily; though I had before the bleeding attempted the reduction in vain.”

Although venesection should prove inadequate to the intended object, other advantages are derived from it; *viz.* that by checking inflammation, it keeps the disorder stationary, and is therefore attended with no loss of time; and, for the same reason, it promotes the success of the operation, should that be afterwards required. I have directed and seen its employment in numerous instances; and cannot recollect any one in which a single venesection, however copious, has been hurtful to a patient with strangulated hernia.

It is hardly necessary to observe, that the conduct of the surgeon cannot be regulated in these cases by the state of the pulse; the pain, tension, and other symptoms, will justify him in employing or repeating this evacuation, where the pulse is weak, and not beyond its natural fre-

quency. Neither should he be deterred from using the lancet by coldness of the extremities, pale countenance, and weak respiration; since these are ordinary symptoms of inflamed bowels: and the experienced surgeon knows, that venesection will raise the pulse, restore warmth to the limbs, and apparently strengthen the patient.

The blood should be drawn rapidly from a large orifice, and in considerable quantity, so as to produce fainting, under which we may attempt reduction with advantage. A small bleeding can do no good, even if repeated.

In the choice of cases, and the mode of employing this remedy, we shall be regulated by the age, strength, and general condition of the patient, and by the species of strangulation. The course just described will be proper in the young, strong, and plethoric; in all instances, where fulness of habit may favour the occurrence of inflammation, and more particularly where symptoms of inflammation may be already present. The abstraction of blood would be particularly suited to those cases, which might be called inflamed, rather than strangulated herniæ; while it is less suited to the more chronic form of the complaint which has been called obstructed hernia. It is more applicable to intestinal than omental ruptures.

The local abstraction of blood by leeching may sometimes be employed advantageously in strangulated, and more particularly in inflamed hernia. This measure is applicable to cases, in which the tumour is painful generally or towards the ring, the abdomen being in its natural state, and the pulse undisturbed; to those, in which the swelling and abdomen are the seat of pain, the pulse and the general powers being so far depressed as to make general depletion unadvisable; also, in order to check the progress of the malady, where the patient has not yet been prevailed on to undergo operation, or altogether refuses to submit to it. If we wish to produce decided effect, we must apply a good number of leeches: it can seldom be worth while to use fewer than twelve or twenty; more frequently it will be necessary to put on two or three dozen. Employed in this way, leeches take a considerable quantity of blood, and they draw it from the parts which are the seat of increased action.

SECTION IV.—THE WARM-BATH.

The warm-bath is used with views partly analogous to those which guide the practitioner in the employment of venesection: it induces a state of faintness and relaxation, under which reduction may be attempted with advantage. The use of opium may be combined with it, if the symptoms of irritation are strong. After the taxis has been unsuccessfully employed, the patient should be placed in the warm-bath, if possible, in the recumbent position: when faintness comes on, the attempts at reduction may be renewed in the bath.

The warm-bath may be used, after venesection, in the early stage of the complaint, when the symptoms are not yet urgent. If the strangulation has lasted for some time, so that the circumstances require dispatch; if it has resisted more powerful means, such as the topical application of cold and the tobacco-glyster, it would be mere waste of time to employ this remedy: when indeed the strangulation is completely formed, the warm bath offers but a slight chance of producing the return of the parts.

SECTION V.—PURGATIVES.

Purgative medicines have been recommended with the view of exciting the peristaltic action of the intestine, and thereby extricating it from the stricture. Experience has taught us to repose very little confidence in these remedies: they are not only inefficacious, but actually prejudicial in the inflammatory strangulation. They are either immediately rejected on reaching the stomach; or, if they pass into the intestines, increase the irritation under which the parts already labour. Hence the most approved surgical writers * of the present day prohibit their employment in cases of that description. In large and old herniæ, where an accumulation of fecal matter, from torpor of the intestine, is the cause of stran-

* POTT'S *Works*, vol. ii. p. 82; RICHTER, *Traité des Hernies*, p. 89; HEY'S *Practical Obs.* p. 128; WILMER, *Practical Obs.* p. 36.

gulation, and the symptoms are of the chronic kind, purgatives may be employed with success; and those of an active description, such as jalap, or the compound extract of colocynth, combined with calomel, the croton oil, alone or combined with calomel and the compound extract of colocynth, are the best: the ordinary combination of Epsom salts and manna, with infusion of senna, is also well suited to such cases.

If vomiting has already appeared, it may be allayed by opium and the effervescing draught, so as to allow a fair trial of the purgative. The most violent remedies of this description are not always the best in such a case. Epsom salt, dissolved in a large quantity of water, and exhibited in small and repeated doses, does not offend the stomach, gently excites the action of the bowels, and is preferable to the more drastic purges. Opium may be combined with this remedy, to make it sit better on the stomach. RICHTER * commends the combined employment of purgatives and opium, and praises highly, from his own experience, the following formula. Melt an ounce of Epsom salt in five ounces of infusion of camomile flowers; add two ounces of linseed oil, one ounce of lemon juice, one ounce of the syrup of red poppies, and two grains of purified opium; shake them well together, and give a spoonful every quarter of an hour, until it operates.

Purgatives are no longer serviceable when inflammation has come on, even in those cases where their employment was proper in the first instance.

An omental hernia is another exception to the general doctrine on the subject of purgatives. If we can clear the intestines completely, the operation will seldom be necessary: bleeding, the warm-bath, and fomentations to the abdomen, may be usefully combined in this case, with such means as will evacuate the bowels. As the tendency to sickness may render it advisable, in such a case, to exhibit the purgative in the form of pills, the union of calomel and the cathartic extract* is well adapted for the purpose;

* *Traité des Hernies*, p. 82.

† Dr. HEBERDEN considers the cathartic extract and vitriolated magnesia to be the best purgatives in cases of ileus. He directs half a dram of the former to be made into five pills, with the addition of a grain or a grain and a half of opium: these are to be taken one at a time. If the vitriolated magnesia be employed, a dram of it should be dissolved in an ounce of water, weak broth, or gruel, and taken every half hour.—*Medical Transactions*, vol. ii. p. 516.

for the same reason, a combination of opium with these medicines may be serviceable.

Purgatives, in the form of glysters, do not seem more efficacious than the same remedies taken by the mouth: if the intestine below the stricture has not been already emptied (which, however, it generally is, soon after the strangulation is formed) glysters will bring away its contents. Their exhibition in this form is not liable to the same objection, which renders it improper to administer them by the mouth; *viz.* the increased irritation which they occasion. In cases, where purgatives are proper, glysters may be combined with them.

SECTION VI.—TOBACCO-GLYSTER.

Glysters of tobacco constitute the most powerful means of relieving incarcerated hernia, independently of the operation. Yet the remedy is not invariably successful. We can by no means assent to the observation of HEISTER,* that the use of tobacco renders the operation in all cases unnecessary. It may be employed in the form of infusion, or decoction, or of smoke: in the former case, one dram † of the herb having been boiled or infused for ten minutes in a pint of water, the strained liquor should be injected; or, it might be safer to inject one half of the quantity, and then wait for half an hour, to see the effect, before the rest is thrown up. The smoke is impelled into the rectum from the well-known apparatus, consisting of a bellows, long pipe, &c. The effects on the patient appear to be nearly the same in both instances, and our present experi-

* "Posteaque aliquot ejusmodi ægros hoc fumo tabaci feliciter restitui ut nunquam adhuc hoc in morbo ad scalpellum accedere opus mihi fuerit."—*Institut. Chirurg.* p. 807.

† One dram of tobacco, boiled or infused in a pint of water, is the quantity generally recommended by English practitioners: the infusion is probably the safest.—POTT's *Works*, vol. iii. p. 276: HEY's *Practical Obs.* p. 140; COOPER's *Anat. &c. of Ing. Hern.* p. 24; HEBERDEN's *Commentaries*, p. 270. This is generally found sufficient to produce the desired effect. The cases quoted below should render us cautious in exceeding this proportion: RICHTER, however, orders an ounce of tobacco in the same quantity of water.—*Anfangsgründe der Wundarzneykunst*, vol. v. p. 264. Can this difference be accounted for by the habit of smoking, which is so common in Germany?

ence does not warrant us in ascribing a preference to either form of the remedy.*

The beneficial effects of tobacco do not depend on its purgative power, as I have already stated that purging glysters are nearly inefficacious. It not only excites the action of the intestines, but exerts a peculiar depressing influence on the system at large; it reduces the pulse, and brings on nausea and sickness, cold sweats and fainting, under which circumstances the parts recede spontaneously, or may be returned by the slightest pressure. Its use should be continued until these effects are produced: the quantity required for that purpose varying considerably in different persons.

The powerful action of this substance on the human frame renders it necessary that we should proceed very cautiously. Sir A. COOPER † has recorded two instances in which death speedily followed its administration. He says, "I once saw a man with whom the tobacco-glyster had been used in the quantity of two drams, without a reduction of the tumour, who about half an hour afterwards, was put upon a table to have the operation for hernia performed; when his pulse was found so low, his countenance so depressed, and his body covered with cold sweats, that he was ordered back to bed, and on carrying him thither he expired. A girl who laboured under strangulated hernia, and who was sent to GUY'S Hospital by Mr. TURNBULL, surgeon, had a single dram of the tobacco infusion injected. It produced most violent pain in the abdomen, with vomiting, in which was thrown up a matter which smelt strongly of tobacco, and she died in thirty-five minutes after the glyster had been administered, and most evidently from its effects."

The smoke was fatal in a case observed by DESAULT § and VELPEAU ‡ records a similar result from the employment of the infusion.

* Mr. HEY prefers the decoction, without mentioning the grounds of his preference, p. 140. POTT and RICHTER seem to think the smoke preferable. The former states, that the smoke does not operate so powerfully on the nervous system as the decoction. The administration of the smoke is often attended with considerable trouble and inconvenience, so that the infusion has grown into general use: and it is the most certain way of employing the remedy. Yet the smoke may be used to a greater extent, without fear of the consequences, than the infusion.

† Part I. edit. 2, p. 33 § *Œuvres*; tom. ii. p. 344.

‡ *Nouveaux élémens de médecine opératoire*; tom. ii. p. 352.

A fatal case, in which the remedy was employed for a disorder of the bowels, is recorded in the *Edinburgh Medical and Surgical Journal*.* “Some years ago I was desired to visit a young man, who was seriously indisposed with the most violent symptoms of colic, for which he had taken a variety of purgative medicines to no purpose. I suggested a glyster of infusion of tobacco, in the proportion of two drams to eight ounces of boiling water. No sooner was it administered than he was seized with something like convulsions, became speechless, and died in an hour or two.” The body was not inspected.

In other instances, two ounces have been consumed in the smoke apparatus before the necessary effect was produced, and such cases have terminated favourably.† I have seen two drachms used in decoction, and two thirds of an ounce entirely consumed in smoke in the same patient, who was fifty years of age, with the production of very slight effect: I afterwards operated on this patient with complete success.

The tobacco has sometimes been successful in cases apparently hopeless; a rupture was reduced by this remedy under Mr. POTT’s‡ direction, when every other means had failed, and the patient had been placed on the table for the operation. Similar instances of its efficacy are related by the same author. I think it worth while to add to the testimony already before the public, the following proofs of its powers; previously observing, that I do this merely to show what the remedy is capable of effecting, and not for the purpose of exhibiting models of the conduct, which a surgeon should pursue in such instances.

CASE I.—All the usual means had been employed ineffectually, in a strangulated scrotal rupture, for the space of five days. The tobacco-smoke was resorted to; and, after persevering in its use for a considerable time, the tumour subsided spontaneously.

CASE II.—In another case where the strangulation had lasted a week, and the feeble pulse, fecal vomiting, pallid countenance, and oppressed breathing, indicated the greatest danger, the tobacco produced its beneficial effect, and the patient recovered.

CASE III.—In one instance, when the smoke was ulti-

* Vol. ix. p. 159.

† POTT’s *Works*, vol. iii. p. 227.

‡ *Ibid.*

mately successful, its effect on the system was at first nearly fatal. The strangulation had existed for three days, in which time purgatives and glysters, large bleedings, and cold applications had been ineffectually employed. The administration of the tobacco produced such a state of tremor and faintness as to make the attendants think the patient was dying. The pulse sank so as to be scarcely perceptible; and the countenance bore marks of approaching dissolution; under these circumstances the stricture gave way, the parts returned, and the nervous system soon recovered from the effects of the remedy.

Mr. KEY says, "I have seen so much success attending the tobacco enema, that I have no hesitation in employing it, with the precaution of proportioning the quantity injected to the age and constitution of my patient. It is, I apprehend, to the neglect of this precaution in regulating the dose, that the objections to this powerful remedy are owing; nor should the robust and feeble, the young and old, be, as they generally are, indiscriminately subjected to the action of tobacco." *

Mr. HEY observes, that the tobacco, like every other means, has often failed; but he adds, "I may venture to say, that I have scarcely ever seen any other remedy succeed without the operation, when this had failed of procuring an evident diminution, at least, of the tumour. One thing must be allowed in favour of this remedy; that it discovers in a shorter time than any other, whether there is a probability of obtaining a reduction of the hernia without the operation. I have usually thought one trial of this remedy sufficient; but have scarcely ever directed more than one repetition. When this has failed of success, the operation has discovered such a state of the strangulated parts as to satisfy me, that no hope of advantage remained from a longer delay." †

M. VELPEAU,‡ after mentioning a case, in which the tobacco injection, employed while preparations were making for the operation, which had been determined on, was successful, adds, that he had subsequently resorted to it in twenty-five instances at least without any advantage.

It thus appears that the tobacco, like every other means, has often failed; but that no other remedy has been so

* Sir A. COOPER's Work; Part I. edit. 2, p. 33, note.

† *Practical Observations*; edit. 2, p. 126.

‡ *Nouveaux élémens de méd. opérat.* tom ii. p. 352.

frequently successful in promoting a reduction, particularly in advanced stages of strangulation; and that when this has appeared, on a fair trial, to be incapable of accomplishing our object, the only resource lies in an immediate performance of the operation. We cannot speak so favourably of the safety, as of the power of this remedy; which has destroyed life in some instances, and probably been injurious in others. The violence of its operation on the animal economy, combined with the circumstance of its frequently failing, account well enough for its not being frequently employed. Venesection is preferable to it in the early period of strangulation; while the great depression of the vital powers makes us hesitate to use it in a more advanced state of the malady. I think it less objectionable in large and old herniæ, where the symptoms depend on obstruction, than in a small and recent rupture, attended with great pain, with small and irregular pulse, anxious countenance, and other evidences of constitutional depression.

SECTION VII.—ANTISPASMODICS.

The utility of antispasmodics in strangulated hernia is much insisted on by RICHTER;* he includes under this denomination the warm-bath, emollient fomentations to the abdomen, opium, ipecacuanha in small doses, &c.

Opium, indeed, has been often recommended, and many cases might be collected, where it should seem to have promoted the return of the prolapsed parts; but general experience does not warrant any great reliance on this remedy. It possesses the power of suspending the pain and vomiting, even where it proves ultimately inefficacious. It may therefore be an useful auxiliary, under certain circumstances, although it cannot be considered as a primary means of accomplishing our object.

“I have seen,” says Mr. HEY,† “several cases in which

* *Anfangsgründe der Wundarzneykunst*; vol. v. sect. 322—329.

† *Practical Observations*; edit. 2, p. 120.

opiates given freely, (in athletic persons after bleeding,) have procured a reduction of a strangulated hernia. I have also received accounts of success by the same means from some of my medical correspondents; but I cannot say that this remedy is generally successful. One circumstance relative to the use of this medicine deserves to be noted, *viz.* that it will often remove for a time the pain and vomiting, usually attendant upon strangulation, even when it proves ultimately inefficacious. I have already related one instance in which the vomiting and pain were suspended during forty-eight hours, so that the patient lay easy, and retained upon his stomach everything that he took, though the strangulation continued. I have seen other instances of persons remaining easy, and free from vomiting, for twenty-four hours, after taking fifty drops of *tinctura opii*. On this account opium is a valuable remedy, when the patient is so situated, that it is necessary to remove him to a considerable distance before the operation can be performed. Opiates should be given in large doses, when it is intended to try their effects in procuring reduction; and whenever the symptoms of strangulation return, after having been removed by the use of opiates, the operation should be performed without further delay."

Dr. HEBERDEN* speaks very highly of the use of opiates, in cases of ileus, from his own experience. The advantages which he has seen derived from such remedies are, that they enable the stomach to bear stronger and more repeated doses of purgatives, obviate the want of sleep, and suspend the distressing anxiety and restlessness. Even if the case should be desperate, they will alleviate the sufferings of the patient, and tranquillise the last moments of that existence which they cannot prolong.

On the use of *ippecacuanha*, and other antispasmodics, my own experience does not enable me to decide. I should not expect any benefit from their employment. When I am informed that the return of a hernia had been effected by means apparently so inadequate as the exhibition of two grains of opium and castoreum,† I cannot help suspecting that reduction might have been accomplished without the aid of these medicines. Not content with employing *ippecacuanha* in nauseating doses, RICHTER actually speaks of giving it in such quantity as to occasion vomit-

* *Commentaries*, p. 272.

† RICHTER, *Traité des Hernies*, p. 52.

ing. I am exceedingly surprised to meet with such a proposal from a person of RICHTER's good sense and great experience. Surely, if vomiting is to effect the return of a strangulated hernia, we may leave the case to nature: this symptom appears speedily enough without the use of emetics.

SECTION VIII.—COLD BATH, AND COLD APPLICATIONS.

The cold bath, and the dashing of cold water on the patient, although, perhaps, successful in a few cases,* have never produced very decided benefit, nor been attended by such general good effect as to warrant their recommendation.

The application of cold to the hernia is entitled to more attention.† This may be conveniently accomplished by pounded ice, in a bladder which should be two thirds full, and placed on the rupture. The solutions of saline substances in cold water, called freezing mixtures, may be employed in the same manner. Nitre and sal ammoniac, or the latter and common salt, finely powdered, should be mixed in equal quantities. Eight or ten ounces of the mixture should be put into a pint of cold water, and a bladder, two thirds filled, should be placed on the swelling. Nitrate of ammonia and water in equal parts, may be used in the same way. The application of folded cloths dipped in iced water, and frequently renewed; and the evaporation of ether‡ upon the part, are other means of accomplishing the same object. We should persist in the trial

* PETIT mentions a case, in which, after the regular and unsuccessful employment of the usual means of art, he had resolved on the operation, and was on the point of making his first incision, when he was stopped by the arrival of the patient's grandmother, who commanded him to desist. She had the patient placed on a blanket, and ordered a bucket of cold well-water to be dashed on the thighs and abdomen; and the hernia returned almost immediately.—*Tr. des Mal. Chir.* tom. ii. p. 325.

† Mr. WILMER has been very strenuous in recommending this practice, and has related several cases of its successful employment.—See the second edition of his tract, London, 8vo. 1802.

‡ Instances of the efficacy of this treatment are related in *Duncan's Commentaries*, vol. xvii. p. 487; and vol. xviii. p. 448. See also SCHMALZ in *LÖDER Journal für Chirurgie*, book i p. 681.

for some time, in order to give it a fair chance; yet caution must be observed on this point; for the scrotum has been frozen by the long-continued use of ice.* If no benefit is derived in the course of four hours, we need not expect success from the further prosecution of this treatment.

A proceeding recommended by Mr. KEY,† as calculated to produce intense cold, may be adopted when other means cannot be procured. It is that of pouring cold water out of a tea-kettle on the swelling, from the height of two or three feet, and keeping up the stream for twenty or thirty minutes.

The topical application of cold is among the most powerful means of treating strangulated hernia, being inferior in efficacy only to venesection and the tobacco. We cannot explain satisfactorily the manner in which this remedy operates. It is supposed, by causing contraction and corrugation of the integuments and dartos, to create a general pressure on the surface of the prolapsed viscera. By lessening vascular distension, and diminishing inflammatory disorder, it will reduce the bulk of the parts; at the same time, it may probably excite contraction of the intestine, and these several effects concur in promoting the reduction. As the sensibility of the swelling is lessened by the operation of cold, the parts may afterwards be handled with less pain.

It has been proposed to combine the external application of cold with a position of the body favourable to the return of the protruded parts. M. RIBES, physician of the Invalides, states, that for a period of twenty-five years, he has invariably succeeded, at that institution, in accomplishing by this plan the return of all strangulated ruptures, whether complicated with inflammation or not. When a patient was brought to the infirmary, the taxis was tried in the usual manner, and discontinued when found unavailing. General bleeding was then employed, more or less freely according to the strength of the patient and the nature of the strangulation: it was followed by the warm-bath, and by purgative and emollient glysters. If these measures were unsuccessful, M. RIBES pursued the following course. By means of an additional mattress or bed doubled, and placed on an ordinary bed, and with the help of bolsters, he made a bed with a very slanting surface, high at the

* COOPER, part i. p. 25.

† COOPER, part i. 2nd ed. p. 34, note.

foot and low at the head. The patient was then placed on it, with the legs hanging over the end, the thighs in a line with the trunk; the pelvis was thus as high, and the diaphragmatic region of the abdomen as low, as possible. A pillow was placed under the head, to raise it a little, that the patient might be able to support the position long enough for the purpose of reduction. Pounded ice in a bladder, one third filled, was then placed on the swelling, and renewed as often as it melted, attempts at reduction being made from time to time. The parts generally returned in ten or fifteen hours: the reduction was seldom delayed beyond the thirteenth hour.*

This method might be safely followed in middle-aged or older persons, and in large ruptures: it is less applicable to small herniæ in young subjects.

The external application of cold may be combined with the use of tobacco.

SECTION IX.—WARM APPLICATIONS.

Poultices and fomentations, both to the swelling and abdomen, were heretofore generally employed in the treatment of strangulated hernia, but repeated experience has so fully demonstrated their inefficacy, that no practitioner of the present day would place the least confidence in them. The constant progression of these cases from bad to worse renders it necessary that effectual means should be resorted to in an early stage of the complaint: hence any mode of treatment, which in itself may be harmless, becomes, from the loss of time which it occasions, positively prejudicial.

In inflammatory strangulation, with tension and pain in the swelling and abdomen, fomentations and poultices may give some ease; and with this view they may be employed when it can be done without omitting or delaying more effectual measures.

* *Bulletin général de thérapeutique médicale et chirurgicale*; December, 1833.

SECTION X.—USE OF CUPPING-GLASSES.

The application of cupping-glasses has been recommended lately, as the means of causing or facilitating the return of strangulated ruptures. The proposal was made by a German physician, who is said to have tried it with benefit in many cases.* A description of the method, with some remarks on its application, by M. LAFARGUE, will be found in the *Bulletin général de Thérapeutique*; March, 1837.† “When cupping-glasses are employed with the view of procuring the return of strangulated herniæ, they are applied either on the swelling, which is thus received into the glass, or above it, that is to say, in the course of the aponeurotic canal, through which the protrusion has taken place. The mode of action must be different in these two methods. In the first, the hernial tumour enlarges in proportion as the pressure of the atmosphere is removed, so that a fresh quantity of intestine comes through the ring. The strangulation ceases as soon as the confined portion has passed the point of constriction, and replacement may then be effected by the taxis. The object of the second is, either to dilate the ring mechanically, or to draw back the protruded parts by means of the vacuum produced in the neighbourhood of the opening through which they have descended.” In both cases, the glass ought to be of large dimensions. If it is not, we shall not accomplish our object in the first case, especially if the rupture be large: for the swelling fills up the space, and we do not succeed in drawing a fresh portion of intestine out of the abdomen. A small glass, in the second mode of employing it, acts merely on the skin and subjacent tissue: unless we employ one of six or nine inches diameter at its base, we shall not produce any effect on the muscles or their aponeurosis, nor influence the parts connected with the protruded viscera. In using cupping-glasses, we may procure the vacuum by heat, by the air-pump, or by suction. The latter is preferable, as the simplest method.

* L. KÖHLER, M.D. *Erfahrungen über den Gebrauch der saugpumpe bey eingeklemmten Brüchen*; in HECKER'S *neue wissenschaftliche Annalen*; 1835.

† *Considérations thérapeutiques sur deux nouveaux moyens de réduire les hernies abdominales étranglées.*

It is obvious that cupping-glasses must act differently in the two modes of proceeding just considered. The efficacy and utility of the plan, considered generally, can only be determined by experience, to which we must trust also for showing what kinds of cases are best suited to each modification of the treatment.

SECTION XI.—EVACUATION OF AIR FROM THE LARGE INTESTINE BY MEANS OF A TUBE INTRODUCED INTO THE RECTUM.

The other method of which M. LAFARGUE speaks in the paper above quoted, is that of procuring the discharge of air from the large intestine by means of a tube introduced at the anus. In the journal entitled *La Clinique*, for July 1829, it is mentioned that a strangulated hernia had been reduced by withdrawing air from the large intestine, through a tube introduced, by means of a syringe. Dr. O'BEIRNE, surgeon to the Richmond Surgical Hospital, Dublin, has employed this method with advantage, using the long gum elastic tube, which he introduces several inches into the canal, so as to allow the escape of air. The rupture has sometimes admitted of reduction in consequence of the relief thus obtained: if this fortunate result should not occur, the canal may be more completely unloaded by throwing up an injection through the tube thus introduced. Dr. O'BEIRNE states, that this treatment has obviated the necessity of an operation in seven instances of complete strangulation, where the usual and most efficacious means had already been resorted to in vain; and that it failed in four other instances.”*

* *London Medical and Surgical Journal*; 1836, vol. ii. p. 148.

SECTION XII.—GENERAL OBSERVATIONS.

It is hardly necessary to observe, that a patient, who has a rupture, which cannot be replaced, ought immediately to go to bed, to place himself in an attitude the most favourable to the return of the parts, and to abstain from eating and drinking.

If the practitioner be called in the early stage of the complaint, and the taxis have been unsuccessful, blood-letting and warm bathing will be the first means for him to employ. I should not, however, recommend the warm-bath, unless it can be prepared expeditiously. Cold applications to the tumour hold the next rank in the list of remedies. Should these be unsuccessful, he will give a fair trial, with as little delay as possible, to the tobacco ; and in the event of its failure, immediately operate.

A surgeon, whose opinion, from his vast experience, and disinterested zeal for the improvement of the profession, is entitled to our greatest attention, has questioned the propriety of commencing operations in all cases of strangulated hernia, by attempts at manual reduction. “If,” says DESAULT,* “the strangulation is slight, the warm-bath, with a proper position of the body, and emollient applications, will bring about the return of the intestines by their relaxing effects. Some cases might, no doubt, be more promptly relieved by the taxis ; but we must place against these all the instances in which our efforts, by increasing inflammation and swelling, are not only useless but injurious. Should the strangulation be more considerable, and require a proportionally greater force, the danger will be augmented in the same ratio. The failure of these exertions leaves the operation as the last resource ; but do not expect it to be successful : the injury already done to the parts is an alarming source of danger.” On this circumstance DESAULT always founds his prognostic, which was generally correct. “Think favourably,” said he, “of a hernia which has not been handled before the operation.” A rule should, therefore, be established, in conformity with these principles, to abstain from the taxis at the beginning of strangulation, and

* *Œuvres Chirurg.* tom. ii. sect. iv.

to employ relaxants. When these have produced an alteration in the tumour, gentle attempts at reduction will complete the business. The treatment of strangulated herniæ was conducted at the Hôtel Dieu, in compliance with these notions. The patient was placed in the warm-bath, immediately on his arrival, with his trunk in the same position as is employed for promoting the return of the parts in the taxis. He was left there as long as he could bear it; perhaps for one or two hours. An emollient cataplasm was placed on the tumour, and clysters were injected. The bath was used three times in the day. When the inflammatory symptoms were considerable, venesection was combined with this treatment.

These remarks are particularly applicable to the inflammatory strangulation; although they do not precisely accord with the usual practice of this country, it will probably be allowed, that they are not entirely unsupported by reason; and they are deduced, according to the representation of BICHAT, from the result of all DESAULT's experience. They who are not disposed to adopt, in their full extent, the opinion and practice of the French surgeon, will probably coincide with him so far as to allow, that the infliction of violence on organs, which, by their construction, are prone to inflammatory action, and, in their natural situation, are completely protected from external injury, may be injurious; that such treatment is more likely to be hurtful, when these organs are actually inflamed: and, at all events, that the rude handling of the rupture by five or six persons in succession can do no good, but may possibly be very mischievous.

The employment of venesection, clysters, and purgatives, if the stomach will bear the last-mentioned remedies, will generally relieve the distressing symptoms of an epiplocele, and preclude the necessity of having recourse to the operation. The application of leeches to the tumour affords a prospect of benefit in this case.

When, as it frequently happens, the aid of the surgeon is not required until the complaint has lasted for some time, a trial of the tobacco, together with the topical use of cold, should be immediately resorted to; as circumstances will not admit of delay in the previous use of less powerful remedies. He should observe the cause and character of the incarceration, and exert his judgment in the

selection of his means, and their adaptation to the circumstances of the complaint.

In a case of inflammatory strangulation, the patient should be bled to syncope; reduction may be favourably attempted during the fainting. If it does not succeed, he may be put in the warm-bath for an hour or two; and the taxis may then be repeated. A warm poultice may now be placed on the tumour, the bleeding repeated, and a purgative clyster injected. If these measures, used in quick succession, should fail, let the operation be resorted to without delay.

In an obstructed hernia, we may begin by attempting reduction, and employ some time in such attempts, diversifying them, to take every chance of success. If the patient be young and strong, a pretty free bleeding may be tried if the taxis should not succeed. Cold may be applied to the tumour. A brisk purgative of calomel and jalap may be administered, and followed by the sulphate of magnesia, in doses of one or two drams, every two or three hours, in some distilled water, or with infusion of senna. The croton oil may be administered alone or in conjunction with calomel and the compound extract of colocynth. Glysters containing infusion of senna may be thrown up. In the failure of these means, we may proceed to the tobacco glyster, which is well suited to such cases. Although the early performance of the operation is not so important as in the preceding case, and it is often had recourse to successfully after a lapse of three, four, or more days, it will be best for the patient to undergo it as soon as the means just enumerated have been fairly tried and found unavailing.

I wish to impress the surgeon with the propriety of giving, without delay, an adequate trial to means of real efficacy, and of performing the operation as soon as it can be clearly perceived that these are unsuccessful.* There

* “In universum notandum, remedia incarcerationi opitulantiā, cito et strenuē abhibenda esse, cum natura hic parum aut nihil faciat, et omnis ægroti salus ab artis auxiliis petenda sit: omnis mora, omnisque tardior aut negligentior remediorum usus, semper damnosus, sæpissime exitialis erit.”—CALLISEN, *pars poster.* p. 464.

This argument has been clearly and forcibly stated by RICHTER, in the following passage of a paper printed in the GÖTTINGEN Commentaries:—
“Quando mitiora remedia sedulo et dextere, ast incassum adhibita sunt, differenda non amplius est operatio. Quid enim spei superest, ut quod primo die non præstiterint, id præstent postero? Increscit omni momento vehementia morbi, increscit vis illa, quæ constringit partes pro-

is no reason to expect that a less active remedy will succeed, when a more powerful one has failed. The chance of reducing a rupture is lessened in proportion to the duration of the complaint: the prolapsed parts becoming more inflamed, are more closely pressed by the stricture, and soon fall into a state, where attempts at reduction by the hand are inadmissible.

The danger to which the patient is exposed by the operation is less than that which he undergoes by delay. In the latter case, inflammation and gangrene of the part, which is thus rendered incapable of exercising its functions, and extension of inflammatory disorder along the canal above the stricture, as well as over the cavity of the abdomen, with rapid exhaustion of the vital powers, are surely produced by a continuance of the incarceration. In this state the operation is performed under the greatest disadvantage, as the local and general disorder both threaten a fatal termination. The death of the patient, under such circumstances, ought not to be ascribed to the operation, but to the continuance of the mischief, which had begun previously to its performance; to the disordered condition of the bowel, which does not resume its office when replaced, but constitutes a source of irritation to the continuity of the canal, and to the serous surface of the cavity. If we operate while the parts are uninflamed, the risk of the operation only is endured.*

Our conduct must not be guided merely by the duration of the case; the kind of strangulation, the nature of the symptoms, the effect of the means employed, and the state of the parts, must influence our determination. Small and recent herniæ, or such as, having been kept up for a long time by means of a truss, are suddenly reproduced, admit of little delay. The strangulation is violent in such instances; inflammation and gangrene soon come on. In old and large ruptures, which have been often down and

lapsas, increscit difficultas medelæ, ut itaque, quæ initio morbi, ubi facilius curatu morbus erat, nil profuerunt remedia, certe sub progressu morbi jam curatu difficilioris nil proderunt; superest hic operatio tanquam unicum remedium, quod, ut jam differatur, nil est, quod suadet, cum ab hoc solo salus expectanda sit, cum increscat omni momento periculum vitæ." *Novi Commentarii*, tom. ii. p. 63.

* "Certum hujus operationis periculum de nimia operationis dilatione pendet, si ægroti jam viribus exhausti partes elapsæ gravissima phlogosi, in gangrænam prona correptæ, et morbus ad reliqua contenta abdominis propagatus fuerit."—CALLISEN, *pars poster.* p. 478.

often replaced, the symptoms are not so urgent, nor the necessity of operating so pressing.*

There is no single circumstance, from which we can determine how long it may be safe to persevere in our attempts to procure a return of the rupture, and when the operation ought to be performed; or distinguish certainly whether the parts have undergone unfavourable change or continue in a healthy condition. Extension of inflammation over the cavity is generally indicated by tension and hardness of the belly, and pain on pressure. It is desirable to operate before these symptoms occur, especially the latter. Hiccup is by no means a sure sign of mortification; it may exist where that change has not occurred, and it is frequently wanting when mortification has happened. A very small and weak pulse, with contracted and anxious countenance, pale and moist skin and cold extremities, indicates approaching dissolution. The operation should be tried, if the patient has strength to go through it; for recovery has sometimes followed under circumstances apparently almost desperate. Even if mortification should have occurred, temporary relief may be afforded by opening the bowel, and thus freeing the canal from the load which oppresses it.

The event of the operation, under any circumstances, is uncertain: but its unfortunate termination arises in most cases, from its being delayed until the state of the protruded parts, or of the system, leaves little chance of success.

It is hardly necessary, in the present day, to combat the opinion, that any time previous to the actual occurrence of gangrene, is early enough for the operation. Inflammation, when it has proceeded to a vehement degree, will certainly end in gangrene: and persons have often died of incarcerated hernia without the complaint proceeding to the termination in mortification.

The danger of delay has appeared so clearly to the best writers on the subject, that they have earnestly inculcated the necessity of resorting early to the operation. The most celebrated practitioners on the continent agree on this point with the great surgeons of our own country; and the dangerous

* I have mentioned some instances already (note in chapter iv. section ii.) where strangulated hernia proved fatal within one day. LE DRAN has related a case in which the operation was performed on the seventeenth day, and the parts were not much affected.—*Obs.* 57.

and fatal effects of delay are strongly represented in many parts of their writings.* Several extracts from works of the highest authority might be adduced in support of this assertion: but I shall content myself with a quotation from the *Practical Observations*† of Mr. HEY: this is particularly valuable, as it exhibits a comparative view of the event of the operation, when performed at a proper time, and when improperly delayed. In the commencement of his professional career, he considered the operation as the last resource, and only to be employed when the danger appeared imminent. “By this dilatory mode of practice,” says he, “I lost three patients in five, upon whom the operation was performed. Having more experience of the urgency of the disease, I made it my custom, when called to a patient, who had laboured two or three days under the disease, to wait only about two hours, that I might try the effect of bleeding (if that evacuation was not forbidden by some peculiar circumstances of the case) and the tobacco-glyster. In this mode of practice I lost about two patients in nine, upon whom I operated. This comparison is drawn from cases nearly similar, leaving out of the account those cases in which gangrene of the intestine had taken place. I have now, at the time of writing this, performed the operation thirty-five times: and have often had occasion to lament that I performed it too late, but never that I had performed it too soon.”

The foregoing statements lead obviously to the following inferences; namely, that a person can be rescued from the danger of strangulated rupture only by the efforts of art: that the constant and generally rapid progression of such cases from bad to worse renders it necessary, that the surgeon lose no time in giving a fair trial to the most powerful means, in order that, if these are inefficacious, the operation may be performed before the prolapsed parts become inflamed and painful: that an operation, done under such circumstances, has every chance of success; but that if symptoms denote inflammation or gangrene, the chances

* See POIT'S *Works*, vol. iii. p. 286; BERTRANDI, *Traité des Opérations*, p. 21; WILMER, *Pract. Obs. on Hernia*, p. 75; RICHTER, *Tr. des Hernies*, p. 105 and 106; CALLISEN, *Syst. Chir. Hod. pars. poster.* p. 473; COOPER, *Anat. &c. of Inguinal Hernia*, p. 26; PELLETAN, *Clinique Chirurgicale*, tom. iii. p. 49; BOYER, *Traité des Mal. Chirurg.* tom. viii. p. 93.

† Page 143.

of a favourable event are much lessened, although the indication is still more urgent.*

I shall describe the operation when speaking of inguinal hernia; and the account then given will apply to the other species also, except in particular points, which will be noticed afterwards.

* A most singular opinion, respecting the operation for strangulated hernia, has been delivered by the celebrated HEBERDEN; and I am induced to notice it here, because the authority of a name so much respected might sanction a practice leading inevitably to fatal consequences. He regards the use of the knife as rarely, if ever, advisable; and professes himself altogether at a loss for rules of judging what cases are proper for the operation, and at what time it should be resorted to. See his *Commentaries*, p. 273. It will not be necessary, after the foregoing observations, to accompany this statement with any comment. I shall only place by the side of it the sentiments of a writer not less experienced than Dr. H., and whose opinion on a surgical subject will claim at least equal authority. “Grave illud periculum quod hernia parit incarcerata, certo præsentissimoque chirurgia tollit remedio, operatione scilicet illa, quæ herniotomia vocatur.” RICHTER, in *Comm. Goett.* tom. v. p. 56.

CHAPTER IX.

ANATOMY OF INGUINAL RUPTURES.

AN accurate acquaintance with the parts, in which these ruptures occur, will elucidate their origin, progress, and treatment; and, when operations are required, will inspire that rational confidence so essential to their successful performance. Without this anatomical knowledge a surgeon cannot proceed with satisfaction to himself, or safety to the patient. We cannot be surprised to find that he puts off decisive measures to the last moment, and, in the hope of escaping from the performance of what he dreads, wastes that time, which ought to be occupied in the operation, in the repetition of trials already found unavailing.

The kind of knowledge, which I allude to, would be sought in vain in the most approved writers on hernia previously to the present century: for, before this period, anatomy had been little studied in reference to its connexion with surgery. I cannot therefore mean to cast any reflection on those surgeons, whose writings have extended and improved the latter art, when I state that they were ignorant of this subject: the fault does not rest with them individually, but belongs to the time in which they lived. A few observations on particular points lie scattered in the works of different writers: but no complete description, and accurate delineation, of even the common kinds of hernia, as the inguinal, femoral, and umbilical, existed previously to the late excellent works of CAMPER,*

* *Icones Herniarum*, Editæ a S. T. SOEMMERRING, Francof. fol. 1801. These plates represent several important points in the anatomy of inguinal hernia, in the accurate and expressive style of delineation, which was peculiar to CAMPER. It must be observed, that although they were not published till after the author's death, they had been engraved as early as the year 1757.

COOPER,* SCARPA,† HESSELBACH,‡ CLOQUET,§ and LANGENBECK.||

* *Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*, Lond. fol. 1804; *Anatomy and Surgical Treatment of Crural and Umbilical Hernia*, &c. fol. 1807.

This valuable work appeared for the second time in 1827, under the title of "*Anatomy and Surgical Treatment of Abdominal Hernia, in two parts*;" Edited by C. A. KEY, Esq., who has added several notes.

† At the time of its appearance, the work of RICHTER, originally written in German (*Von den Brüchen*, 8vo. Goettingen, two vols. 1778 and 1779, 2nd edit. in one vol. 1785) and translated into French by ROUGEMONT, (*Traité des Hernies*, 4to. BONN, 1788,) was the most comprehensive that had been published on this subject: it will be always valuable for the clearness, good sense, and extensive research, which are conspicuous throughout, and particularly for the description of symptoms, and the practical directions, which derive great weight from the author's long experience. Of the anatomy of ruptures he was quite ignorant; and SCARPA alleges this circumstance as the motive for his publication, *Sull'ernie, Memorie Anatomico-Chirurgiche*, Milano, 1809, in Atlas folio; 2nd edition, Pavia, 1819; translated into French under the title of *Traité Pratique des Hernies, ou Memoires Anatomiques et Chirurgicaux sur ces Maladies*, Paris, 8vo. with Atlas in folio; and into English, with reduced engravings in 8vo. by Mr. J. H. WISHART, as a *Treatise on Hernia*, Edinburgh, 1814.

The expectations, which the preceding publications of this consummate anatomist are so well calculated to excite, are completely satisfied by the anatomical accuracy, the taste, the masterly execution, and beauty of the original engravings, and the scientific clearness and simplicity of the accompanying illustrations. The plates of the French translation, although in smaller form than those of the original, are well executed, not only representing all the anatomical facts, but possessing something of the beauty of those from which they were copied. As this and the English translation are in more common use than the Italian original, I have frequently quoted them in the present work; and, for a similar reason, I have referred to the French translation instead of the original German of RICHTER.

‡ Dr. F. K. HESSELBACH, of Würzburg, published in 1806, a tract, entitled *Anatomico-Chirurgical Treatise on the Origin of Inguinal Ruptures*. This was republished in 1814, in an enlarged form under the title of *Latest Anatomico-Pathological Investigations concerning the origin and progress of Inguinal and Femoral Ruptures*, with fifteen plates, 4to. It describes shortly but correctly, the natural structure of the inguinal region, and the anatomy of inguinal and crural herniæ; these subjects being clearly and faithfully represented in the engravings. Although not to be compared, in copiousness of detail and illustration, to the productions of COOPER and SCARPA, the work is creditable to the talents and research of the author, if he was ignorant of the facts previously ascertained and published by those justly celebrated men.

The last-mentioned work of HESSELBACH, written in German, was translated into Latin, and published at Würzburg, in 1816, under the title *Disquisitiones Anatomico-Pathologicae de ortu et progressu Herniarum Inguinalium et Cruralium, cum. tab. XVII. æneis*. The two additional plates contain delineations of an instrument designed to assist the surgeon in detecting the source, and arresting the progress, of hæmorrhage, when arteries are wounded in the operation for strangulated hernia.

Dr. A. K. HESSELBACH, son of the author last mentioned, published at Würzburg, in 1829, a short treatise on the anatomy, causes, and symptoms of abdominal ruptures; *Lehre von den Eingeweidebrüchen*; 1er. Theil. *Entstehung und Ausbildung der Brüche*.

§ *Recherches anatomiques sur les hernies de l'abdomen*; with four engrav-

SECTION I.—ANATOMICAL DESCRIPTION OF THE OPENINGS THROUGH WHICH INGUINAL RUPTURES TAKE PLACE.

Aponeurosis of the external oblique.—The external oblique muscle of the abdomen is terminated in front by a broad and strong aponeurosis, which extends from the anterior and middle part of the chest to the front of the upper margin of the pelvis. This aponeurotic expansion becomes thicker and stronger as it approaches the lower margin of the belly; that being the situation where the greatest pressure of the viscera is experienced, and where consequently the most effective support and restraint are required. Below the navel, and particularly at a little distance above the bend of the thigh and groin, the fibrous fasciculi are stronger and more prominent than they are above the navel, making this lower portion appear opaque, thick and closely woven, in comparison with the upper, which is so

ings; 4to. Paris, 1817. This inaugural dissertation gives a short and clear description of the parts in which inguinal and crural herniæ take place; of the cremaster; of the peritoneum, and its prolongation in front of the spermatic vessels; illustrated by several interesting figures.

The *Recherches sur les causes et l'anatomie des hernies abdominales*; with ten lithographic plates containing seventy-eight figures; 4to. Paris, 1819; was the thesis produced and published by M. CLOQUET in the CONCOURS pour la place de chef des travaux anatomiques.

This very instructive and interesting work is founded on researches, for which the large hospitals and dissecting rooms of Paris afforded unrivalled opportunities. The ingenious and indefatigable author had made five hundred examinations of ruptures on the dead body, and more than six hundred drawings; and he had presented two hundred anatomical preparations of herniæ to the faculty of medicine in Paris. The subjects embraced in this memoir are; the causes of herniæ, and the mechanism of their formation; the hernial sac in its various states; the several modes of reduction, and some of the means employed by nature for the cure of ruptures; and the principal diseases of the hernial sac. The full and clear manner in which these points are treated, and the abundant information which the author displays on all parts of the subject, make us regret that he should not have found leisure to execute the general work on herniæ, which he seems to have had in contemplation.

|| *Commentarius de peritonæi structura, testiculorum tunicis, eorumque ex abdomine in scrotum descensu, ad illustrandam herniarum indolem*; 8vo. cum tabulis xxiv. æneis in folio; Göttingen, 1817. In the numerous well-selected and well-executed figures of this work, the zealous and indefatigable author, who, as Professor of Anatomy and Surgery at Göttingen, so ably sustains the reputation of that celebrated University, has represented most of the important points in the natural and pathological state of the parts, which are the seat of inguinal, crural, and congenital ruptures.

much thinner, as to allow the subjacent muscular fibres to be seen partially through it.

Along the middle line of the abdomen the aponeurosis is attached to the whole length of the linea alba, from the sternum to the pubes; or rather, it unites with that of the opposite side to form this line. It is fixed below to the anterior superior spinous process of the ileum, and to the upper part of the pubes. As the fibres of its lower and thicker part proceed obliquely downwards and forwards, they separate, about an inch and a half from the pubes, into two distinct portions, which constitute the *pillars* or *columns* of the abdominal ring. The upper and inner of these, which is broader than the other, is attached to the upper edge of the pubes, near the symphysis; some of its fibres descend and decussate with those of the opposite side, being fixed to the fibro-cartilage, which unites the two bones, at the same point which affords origin to the suspensory ligament of the penis. The lower and outer, which is narrower, but at the same time thicker and stronger than the other, runs obliquely from above downwards, and from behind forwards, to be fixed by a strong tendon in the spine or tubercle and the crista of the pubes, where it is intermixed with a tendinous substance covering the surface of the bone.

The lower edge of the aponeurosis, stretched like an arch over the great excavation on the upper and anterior part of the os innominatum, which lodges the psoas magnus and iliacus internus, the anterior crural nerve, and the femoral vessels, is best known by the name of FALLOPIUS's or POUPART's ligament, and is now commonly described under the name of CRURAL ARCH.* Although decidedly thicker and stronger than the rest of the expansion, this crural arch or ligament of POUPART is merely the inferior border of the tendon; and we must cut through the latter in its whole length in order to exhibit the part under the form of a ligament. When viewed in this somewhat artificial manner, POUPART's ligament is narrower behind, and increases in breadth towards the front: on the superior surface it presents a concavity, which is broadest and deepest in its anterior half, where it lodges the spermatic cord.

* For further particulars concerning this part, the reader is referred to the "Description of the parts in which the femoral rupture is situated," in CHAP. XIV. SECT. 1.

The separation of the two tendinous columns at their insertion into the front of the pelvis, leaves an opening approaching to a triangular figure, called the abdominal ring, or ring of the external oblique muscle, over the upper and anterior part of the pubes, through which the spermatic cord passes in the male, the round ligament of the uterus in the female, the former part, where it passes out, lying on the outer column at the point of its attachment to the pubes. That bone constitutes the base of the triangle; the two pillars form its sides; and the apex is the part at which the pillars separate from each other:* this latter, however, is not pointed, the opening being rounded off by transverse fibres, which connect the two columns together, and are particularly strong in an old hernia. The aponeurosis of the obliquus externus abdominis consists, for the greater part, of tendinous fasciculi lying parallel to each other, and following the same oblique direction downwards and forwards as is seen in the muscular fibres. But, in its lower and thicker portion these oblique fibres are crossed by others which intersect them at right angles, converting the aponeurosis into a kind of web, and adding materially to its strength, in the region of the crural arch and abdominal ring. The fibres last mentioned arise from the crural arch, spread upwards, sometimes diverging as they proceed, unite the two columns of the abdominal ring, and are lost towards the linea alba. Although the addition of those crossing fibres to the parallel fasciculi constituting the body of the aponeurosis, converts the lower part of the expansion into a kind of web, it must be observed, as M. CLOQUET † has remarked, that the two orders of fibres are not interwoven, but that the former are simply laid upon the latter. These transverse fibres vary considerably in strength; and are sometimes wanting: they are always weaker in women than in men.‡

* The ring of the obliquus externus in the male, and the position of the spermatic cord on its outer column, are well exhibited in the work of CAMPER from subjects affected with hernia; see tab. ix. and tab. xiii. fig. 1. The same parts are exhibited by SIR A. COOPER, in PART I. pl. i.; and in PART II. pl. iii. fig. 1, 3, 4, and 8.

The formation of the female ring is delineated in CAMPER, tab. xiii. fig. 2; and by SIR A. COOPER in PART II. pl. i: and pl. ii. fig. 1 and 2.

† *Recherches anatomiques*; p. 8, note.

‡ The parts described above are mentioned by various authors under the following synonyms.

THE CRURAL ARCH. *Ligamentum POUPARTII.* *Lig. FALLOPII.* *Aeusseres*

The abdominal ring is directed obliquely upwards and outwards; the upper part of it pointing towards the spine of the ilium: this part is often mentioned by the name of the *external angle* of the ring. The base of the triangle, also called *internal angle* of the ring, is situated downwards and inwards with respect to the apex; and the two sides, of which one is external and the other internal, are continued from the apex obliquely downwards and inwards to the basis.* When distended by a rupture, it loses the triangular form, and becomes nearly circular, so that the appellation of ring is not then inappropriate.

The size and form of the aperture vary in different individuals: sometimes it is roundish, and closely embraces the cord or round ligament; in other instances, it is elongated, and the spermatic cord going out near the external angle, turns over the lower column at a little distance from the pubes. Sometimes the pillars remain separate to within an inch or two of the ilium: here the ring is large, and has a square figure. The opening measures about an inch in its longest diameter, from the pubes to the internal angle; the transverse measurement, between the two columns, is about half an inch.

It is smaller, and the pillars are less strong, in the female, than in the male. Without pretending to minute accuracy, we may say that it is one half larger in the latter than in the former.

Fascia superficialis.—The external oblique muscle, the groin, and the upper part of the thigh, are covered by a thin expansion of condensed cellular structure rather than aponeurotic character, which is quite distinct from the fascia lata, and separated from it by cellular tissue, absorbent glands, and the saphena major vein. It was described by

Leistenband; i. e. External inguinal ligament; F. K. HESSELBACH. *Vorderes Leistenband*, or *ligamentum inguinale anterius*; A. K. HESSELBACH.

RING OF THE EXTERNAL OBLIQUE MUSCLE. *External abdominal ring*. *External or lower abdominal aperture*. *Lower or external aperture of the inguinal canal*. *External, under, or lower inguinal or abdominal aperture*; MONRO. *Anneau inguinal*; *anneau du grand oblique*. *Trou sus-pubien*; CHAUSSIER. *Vordere Leistenring*, or *annulus inguinalis anterior*; A. K. HESSELBACH.

THE PILLARS OR COLUMNS OF THE RING. *Crus superius et inferius annuli inguinalis anterioris*.

* If we employ the terms of Dr. BARCLAY, the superior column of the ring is atlantal and mesial: the inferior sacral and lateral; the apex of the ring is atlanto-lateral; the basis sacro-mesial; the internal side is mesial, and the external lateral; the atlantal ends of these two sides are lateral, and their sacral ends mesial.

CAMPER,* who has noticed the principal points in its organisation and connexions. From SIR ASTLEY COOPER, who examined it more fully, it received the name of *fascia superficialis*, by which it is now generally known: he mentions it as dense cellular fascia. It has been accurately described by M. CLOQUET, who calls it a delicate membrane of cellular or aponeurotic structure: “une membrane fine;” “une toile autant celluleuse qu’aponévrotique.” As a cellular expansion, condensed and whitish, it adheres closely to the muscular fibres, but is connected more loosely to the aponeurosis and fascia lata. It is continued to the linea alba, and it passes behind in a simply cellular form over the crista of the ilium and the glutæi. It is thicker and more fibrous over the aponeurosis of the obliquus externus, where it contains the superficial artery and veins of the abdomen. Descending over the crural arch, it adheres to its external margin. At the ring of the external oblique, to which it is loosely connected, it is continued in the form of a sheath over the spermatic cord and testicle, being generally so thin that the fibres of the cremaster and the blood-vessels can be seen through it: to these parts it is connected by a fine cellular tissue. The branches of the external pudic vessels going to the penis run in this fascia. Below the crural arch, the fascia superficialis exhibits distinct fibres parallel to the bend of the thigh. It may be separated here into two or more layers, or rather it forms large irregular spaces containing masses of fat and absorbent glands. It is continued downwards over the fascia lata. It covers the opening at which the saphena joins the femoral vein, adheres to the margin of the aperture, and descends over the vein.

M. CLOQUET observes that it is very thin and indistinct in fat subjects; whitish, thicker, and more easily demonstrated in thin persons; also, that it does not increase the

* “Musculus obliquus igitur externus abdominis, qua parte carneus est, membrana quadam propria, quali omnes muscoli, tegitur, quæ sensim in aponeuros in mutata, ac cum tendineis hujus musculi partibus unita, externe ac anteriore parte abdomen tegit; finem vero nullibi habere perspicuum est, ad pubem enim se miscet cellulosa membrana, cum ligamento penis in viris, ac clitoridis in feminis, involucrum dat musculo cremasteri, ac aponeuroseos speciem musculis anterioribus femoris, qua glandulæ inguinales, ac cruris vasa majora obteguntur. Tabula vii, hanc abdominis partem a sinistro latere exhibui, ut et tabula xiii. fig. 1.”

CAMPERI icones herniarum, p. 11.

strength of the ring, and affects but slightly the tension of the crural arch.

Obliquus internus and transversus.—The aponeurosis of the internal oblique muscle is separated through its greater part into two layers, of which the anterior and thicker joins the tendon of the external oblique, the posterior and thinner is attached to that of the transversus; but the lower portion of this tendon, together with the corresponding part of the transversus, goes wholly in front of the rectus muscle. The lower margin of these two muscles, (the obliquus internus and transversus,) which arises from about the upper half of POUPART'S ligament, is found behind or within the outer column of the abdominal ring, and is fixed to the pubes behind the ring,* which it closes towards the abdomen.†

* The attachment of the transversus to the pubes is mentioned by WINSLOW, sect. iii. § cxi. and by GUNZ, *Obs. Anat. Chir de Herniis*, p. 18.

The mode, in which the outer abdominal ring is closed behind by the insertion of the obliquus internus abdominis is again noticed in the description of the inguinal canal, towards the conclusion of this section.

† The inferior portion of the obliquus internus and transversus is described somewhat differently by different anatomists; their relations to the spermatic cord and cremaster, their mutual connexions, and their anterior insertions being the principal points of difference. The appearances are not uniform in all subjects; the two muscles have their fibres blended below, so that the separation is somewhat artificial; and their connexions with each other, with the cremaster, the fascia transversalis, and the sheath of the rectus, constitute a somewhat intricate subject, in which there is scope for diversity of opinion and representation.

After mentioning that the aponeurosis of the obliquus internus goes in front of the rectus to be inserted into the linea alba, and that it is fixed to the spine and upper part of the pubes, immediately behind the insertion of the two columns, which form the boundaries of the abdominal ring, SCARPA proceeds to say, “ Verso il fianco, alla distanza di otto linee circa dal vertice dell’ anello, le fibrette muscolari inferiori dell’ obliquo interno si divaricano le une dalle altre, per lasciar passare fra di loro il cordone spermatico,” that is, “ towards the side, at the distance of about eight lines from the apex of the ring, the slender inferior muscular fibres of the obliquus internus separate into two parts, to allow the spermatic cord to pass between them. *Sull’ ernie*; Mem. i. § 4. He proceeds to observe that the exterior small bundle of fleshy fibres, resulting from this divarication, is closely attached to the FALLOPIAN ligament, and constitutes the principal origin of the cremaster muscle.

SCARPA represents that the transversus does not come so low down as the obliquus internus. “ Le fibre sue più inferiori non sono sportate da alcun corpo che le trapassi. Imperciocchè il cordone spermatico nell’ attraversare che fa le pareti muscolare del ventre, non passa fra alcuna divaricazione delle fibre carnose inferiori del trasverso, come fa per quella praticata nell’ obliquo interno, la quale dà origine come si è detto, al cremastere, ma scorre soltanto per disotto del margine carnoso inferiore del trasverso muscolo.”—“ Its inferior fibres are not displaced by any body passing between them. Since the spermatic cord, in traversing the muscular parietes of the belly, does not pass through any divarication of the lower fleshy fibres of the transversus, as it

Fascia transversalis.—A thin fascia is extended from the posterior edge of POUPART'S ligament upwards between the peritoneum and the transversus, on the surface of

does through that in the obliquus internus, which gives origin, in the manner already stated, to the cremaster, but merely runs under the inferior fleshy margin of the transversus." The precise situation at which the cord thus goes under that muscle is about an inch farther back towards the side, than the divarication in the fleshy fibres of the obliquus internus. "I have examined with the greatest care, without being able to determine certainly, whether the inferior slender margin of the transversus contributes any fibres to the principal origin of the cremaster. These very thin inferior muscular fibres of the transversus are so closely united to those of the obliquus internus at their common attachment to the crista and to the anterior superior spine of the ilium, that I have not succeeded in separating them. I may, however, assert, without fear of error, that if the transversus, at this point of union with the obliquus internus, sends any fibres to the cremaster, they are very few and very slender."—*Ibid.* § 5.

ALBINUS describes and delineates the passage of the spermatic cord between the fibres of the obliquus internus. "Ab inferiore parte caro valde tenuis est, ibidemque circa medium intervalli inter extremam ilium cristam, mediamque pubem, mox supra imum marginem tendineum obliqui externi, fibris in viro quasi sparsis et cremasteri principium dat, et cum supra, tum infra vasa spermatica decurrit, donec ad extremum in aponeurosem abeat, hac parte tenuem; quæ se cum aponeurosi transversi inserit, pone illam obliqui externi, iisdemque, atque illa, partibus, id est, pubis spinæ, tuberculo, ligamentis." *Historia musculorum hominis*; p. 283. *Tabulæ sceleti et musculorum corporis humani*, tab. xiii. fig. 4 and 5. He says of the corresponding portion of the transversus, "ab inferiore parte tota tenuis, connexaque cum imo margine obliqui externi, deinde cum vagina tendinea femur ambiente, posteaque inserta ossi pubis cum obliquo interno. *Ibid.* p. 287. In his figures of this muscle, however, its insertion into the pubes is not represented. *Tab. sceleti, &c.* tab. xiv.

HALLER mentions the passage of the spermatic vessels between the fibres of the obliquus internus as an occasional variety: "Cremasterem utique muscolum vasorum spermaticorum comitem edit, et nonnunquam erroneæ aliquæ fibræ sub funiculo seminali continuantur." *Elementa Physiologiæ*; tom. iii. p. 67.

M. CLOQUET says, that "the lower fibres of the internal oblique muscle have a nearly transverse direction, and are in general intimately blended with those of the transversus. They are fixed, externally, to the channel of the crural arch; internally they are attached to the upper part of the pubes, between the spine and the angle of the bone immediately behind the internal column of the ring. The lower edge of the muscle, therefore, is parallel to the crural arch. In some individuals, it is distinct from the corresponding portion of the transversus, while in others they are so closely united that they cannot be separated. The lower margin of the transversus, formed of very slender, pale, and scattered fibres, having a transverse direction, passes above the spermatic cord at the point where the latter enters the inguinal canal: it is fixed in front to the lower part of the linea alba, and to the pubes, where it blends with the aponeurosis of the internal oblique. The latter, descending parallel to the crural arch, covers the spermatic vessels in the inguinal canal, and does not pass over it until just before they go through the lower opening of the canal, which they also enter, changing their figure and direction so as to form the cremaster. Its fibres, previously straight and nearly horizontal, become curved and vertical, traversing the external ring, descending below it, and forming in front of the spermatic

which it is gradually lost. By this, the ring of the external oblique is closed towards the abdomen; and, but for this, there would be a direct opening into the cavity of the

cord a succession of inverted loops, which may be followed to the bottom of the scrotum."—*Recherches Anatomiques*; p. 13. In most subjects, the spermatic cord passes simply under the lower edge of the internal oblique, carrying it down to form the cremaster, which then produces only the anterior arches; sometimes, it evidently traverses the fibres of the muscle, in which case muscular arches are formed behind as well as in front."—*Ibid.* p. 18. "I have seen the spermatic cord enter the inguinal canal by passing between the fibres of the transversus, which merely separated to allow of the passage, without accompanying the cord, as those of the internal oblique do."—*Ibid.* p. 23, note.

Sir A. COOPER, who has minutely examined this region, describes in the following manner the lower and anterior portion of the transversus. "Upon raising the lower edge of the internal oblique from POUPART'S ligament, and turning it upwards, the transversalis abdominis appears. It arises from POUPART'S ligament under the internal oblique, and also blends with some of the fibres of the cremaster. It forms an arch over the spermatic cord, and is inserted, with the tendon of the internal oblique muscle, into the tendinous covering of the rectus. But the lower edge of the transversalis has a very peculiar insertion, which I have hinted at in my work on hernia. It begins to be fixed in POUPART'S ligament, immediately below the commencement of the internal ring, and it continues to be inserted behind the spermatic cord into POUPART'S ligament, as far as the attachment of the rectus. Thus the inguinal canal is endowed with muscular contraction, which, under the action of the abdominal muscles, serves to close it, to lessen the propensity to hernia."—"It is this circular insertion of the transversalis which is the cause of stricture in inguinal hernia, in the course of the canal, and nearly at the upper ring." In the *Observations on the structure and diseases of the testis*, from which the preceding account is extracted, (p. 36,) the fifth plate contains two figures intended to exhibit this arrangement both in an external and internal view. In describing the first of these, Sir ASTLEY mentions "the transversalis muscle as arising from POUPART'S ligament and passing around the spermatic cord at the internal ring, so that the fibres of this muscle appear behind as well as before the spermatic cord, and thus the inguinal canal is rendered a muscular canal." "This," he adds, "is a most important provision in preventing hernia; and, when hernia exists, it is often the cause and seat of stricture."

In the passage of his work on hernia, alluded to in the preceding quotation, Sir ASTLEY, after describing the tendon of the transversus to be connected with that of the obliquus internus, and inserted into the linea alba and pubes, observes further, "But the tendon of the transversalis descends much lower than that of the internal oblique; and towards the pubes and GIMBERNAT'S ligament, forms a semilunar expansion, which is connected with a fascia presently to be described, [the fascia transversalis]; it is more particularly by the union of these that the abdominal ring is closed behind. Pl. i. p. 5, second edit.

Mr. GUTHRIE contends that the spermatic cord passes, not as is usually described, under the edge of the transversus, but through a split in its fibres, so that the superior or inner opening of the inguinal canal is bounded by muscular fibres below as well as above. In a passage, however, immediately following this description, he admits that it is not the most frequent arrangement, and that "this part of the muscle [*viz.* that which goes below the spermatic cord] more frequently become tendinous and aponeurotic." *On some points connected with the anatomy and surgery of inguinal and femoral hernia*; p. 13, pl. i.

belly behind the ring.* The fascia in question consists of a thin and delicate expansion. Sir ASTLEY COOPER, who first noticed it, under the name of *fascia transversalis*,† has rightly observed, that in some subjects it appears only as condensed cellular membrane:‡ and M. J. CLOQUET§ calls it a “fibrous, sometimes a merely cellular expansion.” If, after carefully removing the transversus, we press with the finger above POUPART’S ligament, we shall experience a greater resistance than the unsupported peritoneum could offer; and this arises from the fascia transversalis.

Yet it often has a very distinct tendinous structure at its attachment to the crural arch. If we trace it from this part upwards, we shall find it divided immediately into two portions, an internal and external; which leave between them a considerable interval, just in the middle of the crural arch. The former of these, which is the strongest, and most decidedly fibrous, is connected by its inner edge to the margin of the rectus abdominis, and to the inferior margin of the tendon of the obliquus internus and transversus; and both are gradually lost above, between the peritoneum and transversus. The posterior surface of this aponeurosis is lined by the peritoneum.||

As the discovery of this fascia is entirely and exclusively due to the accurate anatomical investigations and patient research of a British surgeon, to whom we are indebted for the illustration of many other important points in anatomy and surgery, I have thought it right, after describing the parts as they have appeared in my own dissections, to sub-

* It has been formerly supposed, that the abdominal ring is covered by peritoneum only, at its posterior surface, and consequently, that the contents of a rupture are protruded directly from the abdominal cavity. Were this a correct representation, inguinal hernia would be much more frequent than it actually is. The following quotation from RICHTER will show the opinion generally held on this subject. After describing the aperture in the tendon of the obliquus externus, he proceeds thus: “Derriere cette fente uniquement remplie par du tissu cellulaire et par les parties mentionnées est placée le peritoine, qui n’est recouvert par aucun muscle, et qui doit non seulement résister à la force distendante, mais encore au poids des visceres de l’abdomen. Cet endroit est ainsi naturellement très foible, et facilite d’autant plus la formation des hernies qu’il est placé en bas.” p. 15.

† Inneres Leistenband. F. K. HESSELBACH; Hintere Leistenband; ligamentum inguinale posterius. A. K. HESSELBACH; Lehre von den Eingeweidebrüchen; p. 52. Fascia musculi transversi; LANGEBECK.

‡ Page 6.

§ Recherches Anat. p. 25. Numerous representations of this fascia are given in the plates of Sir A. COOPER, M. CLOQUET, and HESSELBACH.

|| The third and fourth plates of F. K. HESSELBACH present correct views of the fascia transversalis, as seen from within.

join Sir ASTLEY COOPER's original description of a structure, which ought to be designated by the name of the discoverer.

“ When the lower portions of the internal oblique and transversalis muscles are raised from their subjacent attachments, a layer of fascia is found to be interposed between them and the peritoneum, through which the spermatic vessels emerge from the abdomen. This fascia, which I have ventured to name *fascia transversalis*, varies in density, being strong and unyielding towards the ilium, but weak and more cellular towards the pubes. Midway between the spine of the ilium and the pubes, the opening will be seen, which is now generally known as the internal abdominal ring; the edges of it are indistinct on account of its cellular connexions with the cord; when these are separated, the fascia of which it is formed will be found to consist of two portions; the outer strong layer, [portion,] connected to POUPART's ligament, winds in a semi-lunar form around the outer side of the cord, and bounds the aperture by a distinct margin, from which a thin process may be traced passing down upon the cord. The inner portion, which is found behind the cord, is attached to, but less strongly connected with, the inner half of the crural arch, and may be readily separated from it by passing the handle of a knife between it and the arch. It ascends behind the tendon of the transversalis, with which it is intimately blended, passes around the inner side of the cord, and joins with the outer portion of the fascia above the cord, being at length firmly fixed in the pubes; the inner margin of the ring is less defined than the outer, the fascia transversalis being doubled inwards towards the peritoneum, to which it is firmly attached. Thus, then, it appears that the internal ring is not a circumscribed aperture like the external abdominal ring, but is formed by the separation of two portions of fascia, which have different attachments and distributions at the crural arch; the outer portion terminating in POUPART's ligament, while the inner portion will be found to descend behind it, to form the anterior part of the sheath that envelopes the femoral vessels. The strength of this fascia varies in different subjects; but in all cases of inguinal hernia, it acquires considerable strength and thickness, especially at its inner edge; and if these parts had been formed without such a provision, the bowels would, in the erect posture, be always capable

of passing under the edge of the transversalis muscle, and no person would be free from inguinal hernia.”*

Peritoneum of the inguinal region, and its two fossæ.—The parts forming the anterior boundary of the abdomen, that is, the transversus muscle and the fascia transversalis, with the epigastric vessels, the rectus muscle and its tendinous sheath, are lined by the peritoneum, which descends from the rectus into the pelvis, and passes from the crural arch to the iliac region. Viewed from within, the cavity of the abdomen presents in this situation two superficial excavations, separated by a falciform partition, which supports the umbilical ligament. The latter, which is a fibrous cord representing the umbilical artery of the fetus, can be traced along the external surface of the peritoneum to the navel, though it sometimes ends in slender filaments, which can hardly be followed so far, being apparently lost in the cellular tissue. The two umbilical cords sometimes unite an inch or two below the navel, and proceed to the latter point together, in conjunction with the urachus.

The partition separating the two peritoneal fossæ is a triangular duplicature of the membrane, stretching from the side of the pelvis and bladder, obliquely upwards and inwards, towards the navel: it is broadest below, and gradually becomes narrower above, ending an inch or two short of the navel. Its anterior edge is continuous with the great bag of the peritoneum: the posterior is a little concave, thick and rounded, particularly below, from containing the umbilical ligament, and directed backwards and outwards.

In their relative position, one of the peritoneal fossæ is external, (*lateral*,) and a little superior; the other internal, (*mesial*,) and a little inferior. The latter, which is the smallest, is separated from that of the opposite side by a small triangular fold of peritoneum containing the urachus. The opening in the fascia transversalis is situated in the external fossa, either close to its lower and anterior boundary, or at a few lines exterior to that point. The internal fossa corresponds to the ring of the external oblique muscle, the tendinous insertions of the internal oblique and transversus and the fascia transversalis being interposed between them.

The depth of the peritoneal fossæ varies according to the

* Part i. p. 6, ed. 2.

position of the umbilical ligament, and the size of the triangular membranous fold which supports it. When the former passes at some distance behind the front of the abdomen, the fold is large and the fossæ are deep, particularly the upper one, which may contain several convolutions of small intestine. Sometimes the ligament is closely connected throughout to the abdominal parietes; the fold is inconsiderable, and the fossæ are but slightly marked.

Usually the umbilical ligament is found behind the epigastric artery; but it may be placed at a greater or less distance on the inner or mesial side of that vessel. Hence we explain the varieties in its relative positions to the mouth of the hernial sac, which are thus stated by M. JULES CLOQUET in the propositions appended to his *Recherches Anatomiques*. "The umbilical ligament is always found on the inner side of external inguinal herniæ. In the internal, its position varies; it may be on the outer, or on the inner side; which shows that this hernia may be formed in either of the two peritoneal fossæ. It is more frequently on the inner than on the outer side of the sac in crural herniæ."*

The support which the bag of the peritoneum derives from the abdominal parietes, at the lower and anterior part, is different at different points. In the middle it is firmly sustained by the rectus and the pubes; laterally, by the posterior edge of the crural arch, which sometimes makes a conspicuous projection into the cavity, and offers a firm resistance when we press with the finger. The support is weaker above the crural arch, where we meet with the following parts in succession from within outwards. 1st. The tendon of the rectus and the aponeurotic parts covering it. 2ndly. Opposite to the ring of the obliquus externus, the fascia transversalis, the transversus and the internal oblique; to which parts are added between that ring and the upper opening of the inguinal canal, the spermatic cord and the aponeurosis of the obliquus externus. 3rdly. On the inner edge of the upper opening, the epigastric vessels and the umbilical ligament. At the opening itself, which is partly occupied by the spermatic vessels, and covered in front by the aponeurosis of the external oblique, the peritoneum yields more easily especially to pressure directed in the course of the canal, that is ob-

* Proposition 52, p. 36.

liquely forwards and inwards. 5thly. On the outer side of the upper opening, the fascia transversalis, the transversus, obliquus internus, and aponeurosis of the obliquus externus. Below the crural arch, the peritoneum is firmly supported by the fascia iliaca, the iliac vessels and the pubes.

To the back of the recti muscles the peritoneum is connected by an abundant soft cellular substance, which gives way readily when the fundus of the distended bladder rises towards the abdomen. A tissue of similar character connects the membrane in the inguinal and iliac regions generally; it yields to the force which protrudes the viscera, and allows the peritoneum to be extended sufficiently to envelop the largest protrusions. This soft cellular substance accompanies it when protruded, and connects it to the surrounding parts, viz. to the spermatic vessels and vas deferens, the cremaster, and the common sheath of the cord. The connexion, however, is rather stronger to the fascia transversalis, where it forms the upper opening of the inguinal canal, and to the spermatic cord and round ligament at the same point; also, where the fascia transversalis is united to the aponeurosis of the transversus.

Since the fascia transversalis is situated behind the obliquus internus and transversus muscles, the division between its two portions is covered by these muscles, except in the immediate neighbourhood of the crural arch, where a small part of it appears under their lower margin. This opening gives passage to the spermatic cord, and to the round ligament of the uterus; it was first described by Sir ASTLEY COOPER, in his work *on Inguinal and Congenital Hernia*, under the name of *internal abdominal ring*.^{*†} The superior margin of the aperture is formed by the lower edge of the obliquus internus and transversus: which can be felt distinctly by the finger passed obliquely upwards and outwards, through the ring of the external oblique muscle. The other sides of the opening are not clearly defined previous to dissection, being formed by the fascia

* This opening, and the relation of the spermatic and epigastric vessels to it, are clearly represented by F. K. HESSELBACH, tab. iii. iv. v. and vi. It is the *hintere Leisten-ring*, or *annulus inguinalis posterior* of A. K. HESSELBACH, *Lehre*, &c. p. 53. The *upper inguinal* or *abdominal aperture* of MONRO; *Morbid Anatomy of the Human Gullet*, &c., p. 416. *Inner opening* or *end of the inguinal canal* of LANGENBECK and SCARPA.

transversalis, which is more or less closely connected to the cord as it passes through.

Connexion of the Fascia Transversalis and Spermatic cord.—M. CLOQUET, indeed, describes and represents the fascia transversalis as being continued over the spermatic cord, and constituting its sheath. “Above the crural arch and towards its middle, the fascia transversalis presents an elongated opening, of which the largest diameter is vertical, and the inner edge, thicker and more strongly marked than the outer, is supported by a fibrous fasciculus of falciform shape, rising from the arch itself. This is not to be regarded as a simple opening, but as the broad entrance of a funnel-shaped canal, receiving in man the vessels of the cord, and constituting their sheath. In the female it gives passage to the round ligament of the uterus, being smaller, and often even difficult to discover. The sheath, which it forms round the cord, is a long cellular tube, easily separated, and descending with the cord to the upper end of the testicle, where it is lost in the cellular texture covering the tunica vaginalis.

“The membranous sheath of the cord is covered in the inguinal canal by the lower fibres of the internal oblique muscle, which descend in front of it to form the cremaster.”

“Generally, these parts can be easily separated; sometimes, however, the sheath of the cord adheres so strongly to the cremaster and to the cellular tissue at the margin of the ring that they cannot be separated.” M. CLOQUET adds, “that, although the sheath is in general easily separable from the cellular tissue uniting the several parts of the cord, they sometimes cannot be distinguished; that the sheath is rendered more indistinct, when it is distended by the deposition of fat in the cord, and that he has twice seen it so thick and compact in varicocele, that the cord formed a hard cylinder as thick as the finger.”*

Sir A. COOPER describes and delineates this part nearly in the same manner as M. CLOQUET. He says, that “from the edge of the two portions of fascia, a layer of membrane extends, in a funnel shape, uniting itself with the spermatic cord.”†

* *Recherches anatomiques*, p. 26-7, pl. i. fig. 1, and pl. ii.

M. CLOQUET gives the following instructions for the dissection of the parts described above. “In order to get a good view of the fascia transversalis,

† *On the Structure and Diseases of the Testis*; p. 37, pl. v. fig. 3.

Spermatic Vessels and Cord.—The spermatic vessels, placed behind the peritoneum, descend from the loins, over the surface of the psoas and iliacus internus muscles, connected to them and to the membrane by loose cellular substance; and arrive at the division between the two portions of the fascia transversalis. Here they are joined at an angle more or less acute by the vas deferens: and the spermatic cord, which results from this junction, making a sudden bend inwards, passes into the inguinal canal through its upper or internal aperture. The vas deferens is placed in the canal behind and towards the inner side of the vessels, and consequently under the fleshy margin of the obliquus internus and transversus;* the exact situation of its passage being marked by a slight depression of the peritoneum.† The cord then goes obliquely downwards and

and of the prolongation which it sends to envelop the cord, we must dissect the aponeurosis of the obliquus externus, and then open the abdomen by three incisions; of which the first should be transverse, and extend from the navel outwards; the second vertical, from the commencement of the first, along the linea alba, to the pubes; and the third vertical, from the termination of the first to the anterior superior spine of the ilium. The aponeurosis of the obliquus externus is then detached from above, and turned back on the thigh. We then see the cord lying in the inguinal canal, and covered by the lower edge of the internal oblique. The fibres of that muscle and of the transversus are to be divided and removed, taking care not to cut the sheath of the cord, which is then exposed; we then separate the peritoneum from the fascia transversalis, to which it adheres closely at the commencement of the aponeurosis of the transversus. The epigastric artery remains connected to the posterior surface of the fascia, which is thus detached from all the surrounding parts. The funnel-shaped opening is distinctly seen in this mode of preparation: a female catheter may be introduced into it, and carried within the sheath of the cord to the testicle. We may render the structure still more apparent by drawing the vessels of the testicle towards the abdomen; the sheath is thus inverted, and detached to a certain extent from the vessels, which we may cut off as low down as the detachment extends. If the testicle is again drawn downwards, the sheath is restored to its original position, and represents an empty canal, which will easily admit the end of the finger.”—*Ibid.* p. 28—9, note.

* The part at which the spermatic vessels leave the abdomen was first represented by CAMPER in his *Demonstrationes Anatomico-Pathologicæ*, published in 1760. The *Icones Herniarum* of the same author, which were engraved still earlier than this, represent the same circumstance. WINSLOW also mentions this part without describing it very minutely. Sect. iii. § xciv.

According to the representations already quoted of ALBINUS, SCARPA, HALLER, and CLOQUET, (See *Ante*, p. 186, note,) the spermatic cord passes, either generally or occasionally, through an opening in the fibres of the obliquus internus or transversus.

† SCARPA mentions this depression as “un petit enfoncement en forme d’entonnoir,” of which the progressive development forms the hernial sac. P. 44.

M. CLOQUET says, “that the point, at which the vessels of the testicle enter the inguinal canal from the abdomen is marked in many individuals by a

inwards, between the fascia transversalis and the aponeurosis of the external oblique,* being increased in size by the addition of the muscular fibres, called the cremaster muscle, derived from the lower edge of the internal oblique,

conical funnel-shaped depression of the peritoneum, which often sends a whitish prolongation in front of the vessels. But, that in most subjects, the peritoneum simply passes over the entrance of the canal, and sends off no such continuation."

The appearances found in the cord, in connexion with this peritoneal depression, when it exists, have been minutely investigated by M. CLOQUET, who regards them as vestiges of fetal structure. He has given the following description of them, and has illustrated it by several figures. "The depression is sometimes found five or six lines on the outside of the opening in the fascia transversalis. In some subjects I have found it lying in front of the spermatic vessels in the iliac fossa, to which point it had probably ascended. Usually it does not correspond in situation to the fundus of the great fossa of the peritoneum, which is continued further inwards. Sometimes it is continued into a cellular filament, which is the remains of the tunica vaginalis, or rather of the canal of communication connecting that tunic with the peritoneum in the fetus. This relic of the tunica vaginalis may be found in male subjects of all ages, and almost as commonly in the aged as in the young. The following are the principal varieties, which I have noticed in these parts. 1. The slight depression of the peritoneum sometimes adheres simply to the cord by a dense cellular tissue, in the form of a slender filament, which is soon lost in the cellular substance of the spermatic vessels. 2. There may be a long whitish fibro-cellular cord, which can be traced to the tunica vaginalis. 3. Such a cord, instead of being solid, may present oblong serous cavities, two, three, or four in number, separated by contracted intervals, admitting of inflation, and either ending by a blind extremity or communicating with the cavity of the tunica vaginalis. In the former case the lowest of the cavities is rounded instead of oblong. 4. There is sometimes an elongated cavity, measuring an inch or an inch and a half, rather larger towards its end, contained entirely in the inguinal canal or extended a little beyond, and connected to the peritoneum by a slender neck, which may be perforated by a fine opening, and thus admit of inflation, or, on the contrary, may be solid. In the latter case, the membranous cavity no longer communicates with the peritoneum, but represents a kind of cyst, which may be taken for a shrunk or obliterated hernial sac. At the point, where the pedicle of this cyst is attached, the peritoneum exhibits more or less distinctly a small cicatrix. The sides of the cavities above described are thin, transparent, and elastic; sometimes they are white, opaque, and easily torn; they are moistened by a serous secretion, which may increase in quantity, and form encysted hydrocele of the cord. 5. I have frequently seen the tunica vaginalis, contracted to a slender tube, ascend in front of the cord nearly to the abdomen, and join the peritoneum by a small solid pedicle. In all the cases just enumerated, the cavity of the tunica vaginalis is distinct from that of the peritoneum; but they may be connected by a short and large communication, which is merely the upper extremity of the tunica vaginalis, or by a long narrow canal with contractions at intervals. Through this canal serous fluid may pass from the abdomen into the tunica vaginalis, and thus produce a peculiar kind of congenital hydrocele, of which I have seen an instance."—*Recherches Anat.* p. 39—41, note, plate 4.

* The passage of the spermatic cord through a canal, previous to its penetrating the ring of the external oblique, is expressly stated by GIMBERNAT, in his *Account of a New Method of Operating for Femoral Hernia*, p. 19 and 32.

and from the crural arch. The cord finally emerges through the opening in the tendon of the obliquus externus, and then turns suddenly downwards; lying not so much on the bone between the two columns of the ring, as on the outer column itself, so as to cover its insertion into the pubes.

Thus the vessels of the testicle, making two remarkable turns, pursue three different directions in the successive parts of their course. They descend, inclining at the same time a little outwards, from the loins to the opening in the fascia transversalis. Then they bend inwards and forwards between that fascia and the aponeurosis of the external oblique, making a curve, of which the concavity is turned towards the pubes; the vas deferens makes a sharp angular turn at this part. The spermatic cord makes a second turn with its convexity towards the pubes, and lastly descends straight to the testicle.

Cellular substance of the cord.—The parts composing the cord are connected together by a copious cellular substance, thus described by SCARPA. “The soft cellular texture which envelops the spermatic vessels behind the great bag of the peritoneum, and accompanies them under the fleshy edge of the transversus muscle, passing with them through the separation of the lower fibres of the obliquus internus and along the inguinal canal into the groin and scrotum, continues to surround them as far as the part where they terminate in the testicle. This cellular investment, being a continuation of that which connects the great bag of the peritoneum to the muscular and aponeurotic parietes of the abdomen, becomes thicker and more copious as it approaches the part where the vessels pass out of the inguinal ring, and, after that passage, it is inclosed together with the vessels and the tunica vaginalis testis in the muscular and aponeurotic sheath formed by the cremaster, which extends to the bottom of the scrotum. If we make a small opening in the upper part of the sheath, and impel air through it, the cellular texture is immediately distended, and the cord is swelled into the form of a cylinder extending from the groin to the scrotum as far as the attachment of the vessels to the testicle, where a circular groove or depression is seen, marking the boundary between the cellular substance of the cord and the tunica vaginalis testis. While the part is thus artificially distended, we may carefully slit up the sheath of the

cremaster and expose the investment of the cord, which is then seen as a vesicular spongy tissue, with large and long cells capable of extension without tearing. The spermatic vessels are seen running through it, separate from each other, and near them is that prolongation of the peritoneum, which constitutes in the infant the neck of the tunica vaginalis testis. The diffused hydrocele of the spermatic cord affords another proof how easily this cellular texture may become distended.”*

The cellular sheath of the spermatic cord, which constitutes an investment of tolerably close texture, is connected to the margins of the opening in the fascia transversalis,† and again to the external abdominal ring.‡ The cremaster muscle contributes further to fix and support the cord in its passage through the abdominal parietes, while it provides for the necessary movements of the testicle. The anatomy of this muscle has been examined most minutely by M. JULES CLOQUET and Sir A. COOPER.

Cremaster.—It arises, in the inguinal canal, from the inferior margin of the obliquus internus, from that of the transversus,§ the fibres from this origin going behind the cord, and from the external portion of POUPART’S ligament. The fibres, which are frequently thin and pale, surround and inclose the cord; they descend along its outer side to the testicle; they return and ascend in an opposite direction to be fixed to the pubes or to the sheath of the rectus close to that bone. The fasciculi which compose it are of very different lengths; some reach to the bottom of the tunica vaginalis, others go only just below the ring. Thus they form, in front of the cord and testicle, and in a slighter degree on the back of these parts, a series of inverted arches or loops, the concavity of which is deepest below, and gradually shallower above.|| “The lower fibres of the in-

* *Sull’ernie*; M. I.; § 12.

† Sir A. COOPER *On the Anatomy and Diseases of the Testis*, pl. v. fig. 3.

‡ *Ibid.* pl. v. fig. 1; and pl. vii. fig. 1.

§ SCARPA represents that the transversus does not contribute to the origin of the cremaster, see *ante*, p. 187. That the muscle appears differently in different subjects, and that the differences in description may thus be partly accounted for, has been rightly observed by CAMPER, “Quotiescunque virorum cadavera seco, diversitatem in cremasteribus detego, raro admodum musculus hunc rubentem ac fortem video, plurimum pallidum, vix a membrana sive involucro, quod a musculo obliquo externo abdominis abscedere notavi capite primo, discernendum.” “Culter enim semper has partes extricat, quæ involucro adeo inhærent, ut pro lubitu musculus efformare queas, unde magnam illam inter anatomicos discrepantiam ortam conjicio.”—*Icones hermarum*, p. 11.

|| The best view of this muscle, embracing its origins in the inguinal

ternal oblique," says M. CLOQUET, "traversing the external angle of the ring in front of the cord, ascend again immediately to be fixed to the pubes behind the external pillar of the ring, forming loops of small extent, with their concavity directed upwards. The succeeding arches are more and more developed. I have found some, both in the healthy state and in ruptures, which, still preserving their muscular structure, measured six inches in length; the component fibres of such arches must therefore have been twelve inches long. It requires, however, a very careful dissection to trace these fibres in front of the testicle and tunica vaginalis, since they are thin and pale in that situation: under such circumstances, the cremaster is gradually lost below on the sheath of the cord and testicle. In many subjects, we find this arrangement of the cremaster in arches or loops, not only in front, but also on the back of the cord. The posterior arches are less marked than the anterior, and they form acute angles rather than true curves.*

"In most subjects the cord passes simply under the lower edge of the obliquus internus, carrying with it the lower fibres of that muscle to form the cremaster: here the anterior arches only exist. Sometimes the cord evidently traverses the fibres of the muscle, and arches are formed not only in front but behind, including the cord and testicle in all directions. But the posterior are always less strongly marked than the anterior. All subjects are not equally favourable for these researches; in some we merely find the larger loops, in others the front of the cord is covered by smaller arches."†

M. CLOQUET‡ observes, that the cremaster does not exist previously to the descent of the testicle, but is formed gradually in proportion as this organ, directed by its gubernaculum, passes from the abdomen into the scrotum. In fetuses of five or six months, the lower fibres of the internal oblique, which are very loose, are contained entirely in the canal, adhering pretty closely to the gubernaculum, so that, when that part is drawn downwards, they descend

canal, its attachment to the pubes, and the course of its fibres on the cord, together with the arches or loops on the anterior aspect of that part, is given by Sir A. COOPER in the seventh plate of his work on the testis. See also CLOQUET, *Recherches Anat.* pl. ii., and BLANDIN, *Traité d'anatomie topographique*, pl. vi.

* *Ibid.* p. 14.

† *Ibid.* p. 18.

‡ *Ibid.* p. 15: and pl. i. fig. 2.

with it. If we examine a fetus, in which the testicle has passed the ring, we shall see the inferior edge of the internal oblique extended at its middle to form the cremaster. As the tunica vaginalis still communicates with the abdomen at this period, we can draw the testicle back into the cavity, and thus restore the fibres constituting the cremaster to their original position.

The connexions of the cremaster to the cord and testicle have been carefully traced by Sir A. COOPER. "It envelops the vessels and nerves of the cord in its descent, and forms numerous tendons, which resemble, in their first appearance, nervous filaments. Its insertions are as follows: first, it forms a tendinous sling, which envelops the lower part of the tunica vaginalis: secondly, it sends tendinous fibres into the inferior part of the testis and epididymis, and into the tunica vaginalis: and thirdly, it blends with some cords which surround and enclose the lower part of the vas deferens, and which may be traced to the upper orifice of the inguinal canal, and pass down on the spermatic vessels."

Since the attachments of the cremaster in the inguinal canal and to the pubes are the fixed, and its connexions to the cord and the testicle the moveable points of the muscle, we might describe it as originating from the two former situations by a double head, and inserted by its muscular arches in the latter. The external head, arising in the inguinal canal, is the stronger, (*Faisceau externe*, CLOQUET; *crus externum vel majus cremasteris*;) this is the part usually described as the origin of the cremaster. The internal or pubic head (*Faisceau interne*; *crus internum vel minus*) is much weaker. M. JULES CLOQUET, who first described it and the peculiar arrangement of the muscular arches or loops, says, that this internal head is sometimes wanting, some delicate aponeurotic filaments being found in its place.

Inguinal canal.—The foregoing description shows, that the opening in the abdominal parietes, for the passage of the spermatic cord, is not a ring, or simple round aperture, but an oblique canal, which may be properly termed the **INGUINAL CANAL**.* The crural arch, with the aponeurosis of the external oblique inserted into it in front, and the fascia transversalis behind, forms a narrow and deep

* *Abdominal canal*. *Leisten-canal*, HESSELBACH.

channel, resting on the psoas and iliac muscles and the femoral vessels, extending from the anterior superior spine of the ilium to the pubes, giving attachment to the fibres of the internal oblique and transverse muscles, and lodging in its internal and lower half the spermatic cord and round ligament. The front of this channel is formed by the aponeurosis of the external oblique, which presents, at its lower and inner part, immediately above the pubes, the triangular aperture, usually called the abdominal ring, but now more appropriately termed the *lower or external aperture of the inguinal canal*. The space between the two tendinous columns forming the sides of this lower or external aperture, is closed behind by the insertion of the obliquus internus into the pubes; the spermatic cord issuing from the canal in front of that insertion. This is the only point on the anterior part of the abdomen, where the internal oblique is seen uncovered by the external.* The corresponding surface on the posterior or abdominal aspect of the inguinal canal is a triangular space, of which the inner side is formed by the outer edge of the rectus abdominis, the lower by the horizontal branch of the os pubis, and the outer by the crural and epigastric vessels. At this, which is the weakest point of the cavity in front, the abdomen is closed by the fascia transversalis and the inferior attachment of the obliquus internus and transversus.† The posterior boundary of the inguinal canal is the fascia transversalis, the opening in which, constituting the *upper or inner aperture of the canal*, is placed higher than the preceding, and more externally, being distant from it about an inch and an half.‡ The distance between these two

* This part is especially noticed in the descriptions and figures of F. K. HESSELBACH, who calls it the *crural surface of the anterior inguinal ring*, (*planum anterioris annuli inguinalis crurale*.) *Disquisit. anat. pathol. de ortu et progressu herniarum*, p. 4., tab. i. and ii. A. K. HESSELBACH names it *superficies intercruralis annuli inguinalis anterioris*; in German, *Schenkelfläche des vorderen Leistenringes*. *Lehre*, p. 46.

† This triangular space is called by F. K. HESSELBACH, *dreieckigte Leistenfläche* (*triangular inguinal surface*) *planum inguinum triangulare*. *Disq. Anat.* &c. p. 16, tab. vi.

‡ I subjoin the exact measures of these parts, as given by Sir A COOPER, in the second part of his work on hernia.

| | <i>In the Male subject.</i> | <i>Female.</i> |
|---|-----------------------------|-----------------|
| | Inches. | Inches. |
| From the symphysis pubis to the anterior superior spine | | |
| of the ilium | 5 $\frac{3}{4}$ | 6 |
|tuberosity of the pubes .. | 1 $\frac{1}{2}$ | 1 $\frac{3}{8}$ |

apertures determines the length of the canal, which is obliquely traversed by the spermatic cord. Between the ilium and the upper aperture the channel of the crural arch contains only the lower portion of the internal oblique and transverse muscles; between the two apertures it forms the inguinal canal, and is occupied by the same muscles, with the addition of the spermatic cord.*

Epigastric artery.—The epigastric artery, springing in most instances from the external iliac trunk † near to

| | <i>In the Male subject.</i> Inches. | <i>Female.</i> Inches. |
|---|--|---------------------------|
| From the symphysis pubis to the inner margin of the lower opening of the abdominal canal..... | 0 $\frac{7}{8}$ | 1 |
|inner edge of the upper opening..... | 3 | 3 $\frac{1}{4}$ |
|the middle of the iliac artery | 3 $\frac{1}{8}$ | 3 $\frac{3}{8}$ |
|iliac vein | 2 $\frac{3}{8}$ | 2 $\frac{3}{4}$ |
|origin of the epigastric artery | 3 | 3 $\frac{1}{4}$ |
|course of the epigastric artery on the inner side of the upper opening..... | 2 $\frac{3}{4}$ | 2 $\frac{7}{8}$ |
|middle of the lunated edge of the fascia lata | 2 $\frac{3}{4}$ | 3 $\frac{3}{4}$ |
| From the anterior edge of the crural arch to the saphena major vein | 1 | 1 $\frac{1}{4}$ |
| From the symphysis pubis to the middle of the crural ring | 2 $\frac{1}{4}$ | 2 $\frac{3}{8}$ |

The following statement is by M. VELPEAU. In a well-formed adult, the passage of the spermatic cord, measured from one opening to the other, is one inch and a half or two inches in length, and three inches, including the openings. In some subjects I have found it half an inch or an inch more; while in others it is so short, that the outer edge of the scrotal orifice is nearly opposite the inner edge of the abdominal opening. In young subjects the two apertures nearly correspond, so that the parts escape through a ring rather than a canal.—*Nouveaux Elémens de Méd. operat.* tom. ii. p. 449.

* The terms of Dr. BARCLAY would enable us to express more accurately the relative position of the two openings of the abdominal canal. The aperture in the tendon of the obliquus externus is sacral, mesial, and dermal; that of the fascia transversalis is atlantal, lateral, and central.

† A. K. HESSELBACH examined the origin of the epigastric artery carefully on each side of the body in thirty-two subjects, and found the following results, in which the right and left arteries are enumerated separately.

| | |
|---|-----------|
| The epigastric arose from the external iliac..... | 35 times. |
| The epigastric arose from the femoral | 5 — |
| The epigastric and obturatrix arose by a common trunk from the external iliac or crural | 23 — |
| The epigastric arose from the obturatrix | 1 — |
| The epigastric arose by a trunk, common to it with the obturatrix and circumflexa femoris interna from the femoral near the crural arch | 1 — |
| The epigastric arose by a trunk common to it with the obturatrix and circumflexa ilii, from the front of the femoral behind the crural arch | 1 — |

the crural arch, ascends obliquely over the bag of the peritoneum in the neighbourhood of the inguinal canal. Its origin is about an inch below the convexity of the peritoneal sac, in a loose cellular texture, which accompanies the spermatic and femoral vessels in their descent through the inguinal and crural apertures. The artery comes off from the inner side, or from the front of the external iliac under an angle more or less acute with the trunk. Concealed at first by the crural arch, it lies behind the inferior margin of the obliquus internus and transversus; then, passing over the peritoneum, it ascends obliquely from the groin to the posterior surface of the rectus abdominis, which it reaches after a course of about two inches and a half.* In passing along the crural arch, the trunk of the artery is covered in front by the spermatic cord, just before the cord enters the inguinal canal. It runs between the fascia transversalis and the peritoneum, along the lower and inner edge of the internal abdominal ring, in general precisely along the inner margin, but sometimes rather nearer

The fourth of the preceding varieties, which is also mentioned by MONRO, (*morbid anatomy of the gullet*, &c. p. 427,) but had not occurred to TIEDEMANN (*explicat. tab. arter. p. 295*), is delineated in pl. ii.

Ueber den Ursprung und Verlauf der unteren Bauchdeckenschlagader und der Hüftbeinlochsclagader; 4to. 1819.

M. VILPEAU mentions two other varieties of the epigastric artery. "In a body examined by M. MICHELET, at the Hôpital Cochin, it arose in the thigh from the internal circumflex, and then ascended to its ordinary situation between the peritoneum and the abdominal muscles. M. LAUTH has recently informed me, that he had met with two epigastric arteries on the same side, one from the external, the other from the internal iliac: one was on the outer, the other on the inner side of the cord."—*Nouveaux élémens de méd. opérat.* Tom. ii. p. 452.

TIEDEMANN saw the common trunk of the epigastric and obturatrix coming off from the femoral, a little below the crural arch, and has delineated this variety: tab. xxxiii. fig. 4. He also met with one example of the epigastric arising from the profunda femoris; tab. xxxiii. fig. 3.

MONRO mentions the origin of the epigastric and internal circumflex of the pelvis (circumflexa ilii?) by a common trunk from the external iliac. He says, that he has seen it arising from the profunda femoris; and that "it sometimes arises from the pudic artery;" p. 426. The latter origin I do not understand.

The origin of the epigastric from the external iliac is usually within half an inch of the crural arch; it may be as much as an inch, or even more, above the arch. It may arise behind the arch, or a few lines, sometimes nearly an inch, below it.

* F. K. HESSELBACH, *disq. anat. pathol.*, &c.; tab. v. and vi.

COOPER *on inguinal and congenital hernia*, pl. ii.; *on crural hernia*, pl. ii. fig. 6; pl. v. fig. 3.

SCARPA, *Sull'ernie*; Tav. i. ii. iii. viii.

TIEDEMANN, *tabulæ arteriarum corporis humani*; tab. 25, 26, 28, 29, 30, 31, 33.

BLANDIN, *anatomie topographique*; pl. vii.

to the pubes, passing at the distance of nearly an inch from the upper extremity of the ring of the external oblique. When the two columns of the latter ring remain separated further than usual, so that the aperture is elongated, its external angle or apex is proportionally nearer to the course of the epigastric artery.

The epigastric artery is accompanied by veins, of which the largest is constantly found on the inner side of the artery. They end by a single trunk in the iliac vein, a little lower than the origin of the artery.*

The epigastric artery produces, near its origin, two or three small branches, which it might be necessary for the surgeon, under some circumstances, to be acquainted with. One of these, arising from the inner side of the vessel, runs transversely, close on the pubes, in the loose cellular texture between the peritoneum and the bone, towards the symphysis, and is lost on the posterior surface of the rectus.† It anastomoses with the corresponding vessel of the opposite side, and with a branch of

* For the use of students I subjoin a short direction for the dissection of the parts described in this chapter. After exposing the tendon of the obliquus externus at its lower part, and particularly where it forms the crural arch, as well as at its double insertion into the pubes, let a transverse incision be made through it, beginning at the lineæ semilunaris, about an inch above the situation of the navel, and carried directly outwards. From the termination of this cut a perpendicular one should be extended to the crista of the ilium; and the obliquus externus should be separated from that part of the bone. The incision must now be continued through the tendon, parallel to the crural arch, and just above it, as far as the lower opening of the abdominal canal, leaving that, however, entire. By turning the flap, thus separated, over towards the lineæ alba, we gain a view of the spermatic cord passing between the two openings; of the inferior margin of the obliquus internus and transversus, which are here united into one, crossing over the cord to be fixed into the pubes behind the ring; and of the cremaster expanding over the spermatic vessels. A careful reflection of the muscles just mentioned from the crural arch, will bring the fascia transversalis into view, with the passage of the cord in the space left by its division; and a very little dissection will expose the epigastric artery on the inner edge of the upper opening of the canal. By laying down again in its place the reflected portion of the internal oblique and transverse muscles, their relation to the course of the spermatic cord may be exactly ascertained; and, as the attachment of the external oblique to the pubes still remains, the distance and relative position of the two openings may be immediately perceived. The most natural view of the superior aperture may be taken from within, by carefully removing the peritoneum from the crural arch, and adjacent parts. The fascia transversalis, with its division, may be then seen without any farther dissection; the entrance of the spermatic vessels and vas deferens into the canal, and the course of the epigastric vessels, are exposed in their most natural position; and the connexion of the fascia transversalis to the edge of the rectus is clearly seen.

† This vessel, under the denomination of *Ramus in facie superiori ossis pubis decurrens*, is delineated by TIEDEMANN, tab. xxix. fig. 2; and tab. xxxi. A. K. HESSELBACH calls it *ramus pudendalis superior*.

the obturatrix. Another, springing from the trunk in front, passes immediately to the spermatic cord, and runs along it to the scrotum, its branches being distributed on the cord and its coverings.*

The concavity of the curve, described by the spermatic vessels and vas deferens at their entrance into the inguinal canal, seems to rest on and be supported by the epigastric vessels. When the latter are removed, however, we find that the cord of the testicle is principally supported by the inner edge of the aperture in the fascia transversalis, which sustains them entirely when the epigastric artery runs nearer than usual to the pubes.

When we consider the thinness of the lower margin of the internal oblique and transverse muscles, that an opening is left under them for the passage of the spermatic cord, and that the ring of the external oblique is protected behind only by the aponeurosis formed by the fascia transversalis and the tendinous insertions of the two former muscles, we shall readily perceive this to be the weakest part of the abdominal parietes. Its position in the lower region of the belly, by subjecting it to greater pressure, concurs with this weakness in making it the most frequent seat of rupture.

Points at which inguinal herniæ protrude.—All the ruptures, which take place through the opening in the abdominal parietes, just described under the name of inguinal canal, are called *inguinal*; which epithet, as well as the synonymous term *bubonocèle*,† derived from the Greek, denotes a circumstance common to the complaint in all its varieties, namely, that the rupture, arising in the groin, causes, at least in its beginning, a swelling in that region. As the protrusion increases, the parts, which first presented in the groin, descend into the scrotum, constituting a *scrotal* rupture; in the female they pass into the labium

* The origin and distribution of this artery are displayed by TIEDEMANN, tab. xxxi. He calls it *arteria spermatica externa*; or *arteria tunicæ vaginalis communis*. It is described under the former name by A. K. HESSELBACH, *über den ursprung und Verlauf*, &c. p. 5, who gives it in the female the name of *uterina externa*, as it passes along the ligamentum teres to the uterus. In one instance, he found it arising as a separate branch from the crural artery. *Lehre*, &c. p. 68.

Sir A. COOPER has described and figured it under the name of *cremasteric artery*. *Obs. on the structure and diseases of the testis*; p. 39, pl. 5, fig. 3; and pl. 6, fig. 3.

† From *βουβων*, groin, and *κηλη*, tumour: *bubonocèle*, therefore, means literally, swelling in the groin.

pudendi, forming a modification of the complaint not characterised by a separate name, and therefore included under the common denomination of inguinal.

In the great majority of cases the parts are protruded directly over the spermatic cord; at first, therefore, they penetrate the upper opening, and afterwards, having traversed the canal, make their appearance through the ring of the external oblique. Or, they may enter the upper opening, and remain in the canal, without continuing their course through the lower one, so that they form a swelling covered by the aponeurosis of the obliquus externus abdominis. The former is a *complete*,* and the latter an *incomplete* inguinal hernia. Again, they may come directly through the inferior aperture, without passing along the canal: probably this form of the complaint is always a complete rupture. In the two first cases, the parts are protruded at the external, in the last, at the internal excavation or fossa of the peritoneum. (See page 191.)

The first of the three preceding varieties was appropriately denominated by HESSELBACH *external*, in contradistinction to the third, which he called *internal* inguinal hernia. These terms, of which the former is equivalent to *lateral* and the latter to *mesial* of Dr. BARCLAY, are derived from the relative situations, at which the herniæ first protrude from the abdomen: the point of protrusion, in internal inguinal herniæ, is near the mesial line of the body; in external, it is farther from that line. The second, or incomplete variety, belongs also to the external division. These epithets of *external* and *internal*, which are adopted by SCARPA,† express also the position of the mouth of the sac in relation to the epigastric artery. The *external* or more common kind of inguinal rupture, whether complete or incomplete, passes out of the abdomen on the outer side of the line described by the course of the umbilical artery, or on the outside of the intersection of the spermatic cord and epigastric artery; the *internal*, on the inner side of the same line or intersection.

* The epithets *complete* and *incomplete* are used sometimes in a different sense. The hernia has been called *incomplete*, while the parts are still in the groin; *complete*, when they have descended into the scrotum or labium pudendi. The names are badly applied in this case, since the rupture, in all its essential characters, is as complete in the former case as in the latter.

† Sull' ernie, Mem. i. Sect. xxvi. in which he quotes F. K. HESSELBACH'S *Anatom. chirurg. Abhandlung über den ursprung der Leistenbrüche*; with four plates; Würzburg, 1806.

The *external* and *internal* inguinal ruptures are called by Sir A. COOPER, respectively, *oblique* and *direct*; because the protrusion pursues in the former an oblique, in the latter a direct course through the abdominal parietes. However, in an external hernia, which has lasted some time, the opening, although at first slanting, becomes ultimately direct.

The description of these parts will apply, *mutatis mutandis*, to the female, where the round ligament of the uterus supplies the place of the spermatic cord; except that the opening in the tendon of the external oblique is considerably smaller, and that there is no cremaster.

SECTION II.—ANATOMICAL DESCRIPTION OF EXTERNAL OR OBLIQUE INGUINAL HERNIA.

The great majority of inguinal ruptures come under this description. The viscera are protruded through the opening left between the two portions of the fascia transversalis, and under the margin of the internal oblique and transverse muscles; that is, at the point where the tunica vaginalis communicates with the abdomen in the fetus, and where the spermatic cord passes out in the adult. They pass through the inguinal canal, in close contact with the anterior surface of the cord, and come out at the aperture in the tendon of the external oblique muscle.* The mouth of the sac is at the upper opening of the canal, and is therefore placed nearly in the middle of the space between the anterior superior spine of the ilium and the angle of the pubes: from this point the neck of the sac

* The two following varieties in the course of the rupture are noticed by M. VELPEAU. Instead of passing through the opening in the fascia transversalis, the hernia may occur externally to this aperture, separating the fibres of the external portion of the fascia. M. BLANDIN ascertained this point in one instance by examination of the body. J. L. PETIT noticed another variety of inguinal hernia, in which the parts had escaped between the fibres composing the external pillar of the ring. Messrs. ROUX and VELPEAU have seen this form of hernia. The epigastric artery in all these cases is on the inner side of the mouth of the sac. *Nouveaux élémens de Méd. opérat.* tom. ii. 465-6. Neither of these varieties is of any practical importance: one of them certainly, and probably both, could only be ascertained by dissection. I have not seen either.

extends obliquely downwards and inwards between the aponeurosis of the external oblique, and the fascia transversalis; and the production of peritoneum, escaping through the lower opening of the canal, is continued directly downwards.*

When the hernia is first formed, the distance between the two openings, and their relative position, are the same as in the natural state. But the pressure of the protruded viscera, by enlarging the superior aperture, gradually brings it nearer and nearer to the inferior; so that in an old and large rupture, the opening into the abdomen is almost direct. The effect of this process is such, in all cases, that we seldom meet with an instance, in which the rupture has passed the tendon of the external oblique, where the natural distance between the two openings is preserved.

External covering of the hernia.—The peritoneum, being protruded directly over the spermatic vessels, passes between these and the cremaster muscle, in the loose cellular tissue which unites them. The cremaster, together with a condensed cellular substance, partly attached to the margin of the ring, partly continuous with the fascia superficialis, forms a covering, which envelops the cord and the testis with its membranes, being united to them by a loose and easily separable tissue, and is described by some anatomists as the *tunica vaginalis communis* of the spermatic cord.† The peritoneal process distends this soft tissue,

* The general course of the protrusion, its oblique passage through the inguinal canal, and the distance between the two apertures of that canal, are well exhibited by LANGENBECK, tab. xiii. and xiv.

† The fibres of the cremaster, says SCARPA, “parvenues audehors de l’anneau, deviennent très flexueuses, se répandent dans différens sens, et se croisent de diverses manières, jusqu’à ce qu’elles se terminent toutes dans une sorte de gaine tendino-membraneuse, qui renferme le cordon spermatic avec son enveloppe cellulaire, et la tunique vaginale du testicule.” p. 24. The facts are beautifully represented in pl. 1 and 2.

The origin and nature of this external investment of the testicle and cord are somewhat differently described by Professor LANGENBECK. He says, that the peritoneum everywhere consists of two laminæ; an *external*, connected by cellular substance to the tendinous and muscular parietes of the abdomen; an *internal*, forming the serous bag which contains the viscera. The former is not to be regarded as merely cellular, but has a close membranous structure, and can be separated and turned back from the latter, as a distinct and uniform texture. *Comment.* sect. xxiv. and xxv. The kidneys, ureters, bladder, spermatic and other vessels at the back of the abdomen, are placed between these two layers of peritoneum, enveloped by the external, but situated on the outside of the internal. *Ibid.* sect. xxxii. The peritoneum, which descends with the testicle, is a production of both these layers, the spermatic cord being placed between them. P. 62. The external layer,

and passes between that tunic and the spermatic vessels; it is consequently provided with an exterior investment from this source; and the covering is common to it with the cord and testis.*

The hernia, as it descends into the scrotum, continues still in front of the spermatic vessels, (with exceptions to be noticed presently,) is still involved together with them by the tunica vaginalis communis, and arrives at last at the upper end of the testis, where the spermatic vessels terminate in that gland, and the common tunic is connected by a closer and stronger texture to the tunica vaginalis testis. Here its descent terminates, and we see a mark of division at this point, between the bottom of the sac and the testis, in the oldest scrotal ruptures, when they are dissected.

Some tendinous fibres, derived from the aponeurosis of the external oblique, where it forms the lower opening of the inguinal canal, may be occasionally seen in this external investment. The pressure of the tumour occasions a considerable thickening of the part in old herniæ, where several distinct layers may often be recognised; and the thickness of the sac, taken altogether, depends on this circumstance.†

The fibres of the cremaster, in the natural state, are few, thin, pale, and confounded with the superficial fascia, which closely covers them; they are increased when inguinal hernia has existed for some time, and acquire a surprising development in old scrotal ruptures, where they consist of large red bundles irregularly interwoven, spread from the upper and anterior towards the lateral and lower parts of the swelling.

The external pudic vessels are distributed about the sac and integuments, and their branches acquire a considerable size in old scrotal ruptures.‡

Surgeons have not in general been aware of the existence

which includes the testicle, the cord, and the process of the internal or serous layer, constitutes the tunica vaginalis communis; and it forms the exterior covering of the hernial sac in external inguinal ruptures. See tab. i.—iv. also viii. ix. and x.

* The relation of the external covering to the hernial sac, the testis, and cord, is well exhibited in LANGENBECK, tab. x.

† “ Je puis assurer, d’après un grand nombre d’observations, que, dans la plupart des cas, le sac herniaire proprement dit, ne s’épaissit pas sensiblement, et qu’en général il ne diffère point des autres parties du péritoine, quelle que soit le volume et l’ancienneté de la hernie scrotale.” SCARPA, p. 53.

‡ CAMPER, tab. xiii.

or origin of the external covering now described. They have supposed the hernial sac to consist merely of peritoneum in various states of density: and represent the thickened state, in which it is frequently found, to arise from distension. Yet some writers have understood the real nature of the case. MERY* found three coverings over the sac in a large hernia; and PETIT,† in describing the operation, speaks of exposing and dividing “the membranes common to the hernia, with the spermatic cord and testicle.” The peritoneal sac, according to MAUCHART,‡ is surrounded by a thicker external coat, separable into many layers, and having in its composition tendinous fibres derived from the aponeurosis of the external oblique muscle: for which reason he calls it *tunica aponeurotica*. The latter fact is noticed also by GUNZ.§ SHARP|| very correctly observes, that “when the herniary sac falls into the groin or scrotum, the investing membrane, (of the spermatic cord,) together with the cremaster muscle, which covers it, become distended, and form, in consequence of that violence, an absolute vagina.” The exterior covering of the hernia is not only described but delineated by WRISBERG.¶ He calls it *velamen accessorium*, and represents it in the view of a dissected oscheocele. A most explicit statement of the anatomical structure, with some excellent views of the parts, will be found in CAMPER,** from whom I take the following quotation: “Cremasteres igitur musculi sunt, ab obliquo interno et transverso abdominis orti, per involucrium membranaceum sub cute scroti dispersi, quocum velamentum efformant, funiculum spermaticum et testem undequaque cingens, quod in herniosis crassius tenaxque fit, et ex multis sibi invicem impositis lamellis constare videtur, cum chirurgia hernias attingimus. Velamentum illud facile a sacco herniæ digitis separatur, fir-

* *Mem. de l'Acad. des Sciences*, 1701. “Observations sur les Hernies.”

† *Traité des Mal. Chirurg.* tom. ii. p. 362.

‡ *Dissertatio de Hernia Incarcerata, nova Encheiresi extricata*. Tubingen. 1722; and in HALLER *Disput. Chirurg. Select.* tom. iii. “*Saccus externus multo crassior est interno, inque varias separari lamellas potest,*” &c. cap. ii.

§ *Observationum Chirurgicarum de Herniis Libellus*. Lipsiæ, 4to, 1744, p. 50, 51.

|| *Critical Inquiry*, ed. iii. p. 5.

¶ *Commentationes reg. soc. scient. Goettingens.* 1778, p. 69.

** *Icones Herniarum*, p. 13. The hernial sac and testis, inclosed in their common investment, are well exhibited in tab. vi. and ix.; with the latter laid open in tab. viii and x.

mius autem adhæret vasis spermaticis." Lastly, a full description of the facts is contained in Sir A. COOPER's *Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*, and in the work of SCARPA.*

Situation of the Spermatic Cord.—The spermatic cord, since the viscera are protruded directly over it, is placed behind the hernial sac.† If the tumour has descended to the bottom of the scrotum, the cord lies behind it, through its whole course, and the testis, with its coverings, is in contact with the lower end of the swelling. Where the rupture is not so large, more or less of the cord can be felt between the lower end of the tumour and the testis. I have already described the common covering of the hernia, cord, and testicle, made up of the cremaster muscle and tunica vaginalis communis: this is connected universally by cellular adhesions to the parts which it invests, and more closely to the spermatic vessels than to the sac. The latter part adheres firmly by similar adhesions to the spermatic vessels; and would require a cautious dissection for its separation in the living subject.

Varieties in the course of the Cord and its Vessels.—The spermatic cord sometimes deviates from the course now described. Its situation at the upper opening of the canal, with respect to the sides of that aperture, hardly allows us to suppose, that the contents of a rupture can be protruded in any other direction than over it; but we can easily conceive, that the relation of the tumour to this part may be changed after it has passed the ring of the external oblique muscle, so as to present the varieties now alluded to.

SCARPA has explained this subject at considerable length; and rightly refers the separation of the vessels, which compose the cord, to the distension of the surrounding parts, by the increasing tumour. It will be remembered, that the hernial swelling and the spermatic vessels are included in a common sheath; and that the latter are connected by

* His description is very similar to that of CAMPER, quoted above. "A l'endroit où le cordon spermatique et le sac herniaire réunis, passent dans l'écartement des fibres inférieures du petit oblique, on voit le muscle crémaster se porter sur leur côté externe, et les accompagner jusqu'au-delà de l'anneau, où il se convertit, comme je l'ai déjà dit, en une gaine musculaire et aponevrotique, qui, renfermant le sac herniaire, le cordon spermatique et la tunique vaginale, accompagne ces parties jusqu'au fond du scrotum." M. i. sect. xviii. and pl. i. and ii.

† CAMPER, tab. v. and xii.

cellular substance to each other, and to the production of peritoneum. So long as the protrusion continues of moderate size, it does not affect the relative position of the parts composing the cord to each other or to the sac. When the swelling increases, all the surrounding parts are distended, and the cord, being so closely in contact with it, partakes of this distension; the loose cellular tissue connecting the component parts yields readily, and allows their separation to a greater or less distance from each other. This separation and displacement bear a proportion to the size of the rupture; they are also greater in the largest part of the swelling, and less above and below this situation. At the ring, the cord is always found behind the sac. In large and old scrotal ruptures, the swelling sometimes passes so deeply between the parts that compose the cord, that they are no longer found at the back of the sac, but at its sides, and even advance below towards its anterior surface. A similar change was found by SCARPA to occur in large and old hydroceles: the increase of the watery tumour affecting the spermatic vessels and the vas deferens in the same way as the growth of the rupture.*

The separation of the vas deferens and spermatic vessels is seen on both sides, in a case of old double scrotal hernia now lying before me. They are about two inches apart, and at the back of the sac, on one side; and more considerably separated on the other, where the middle of the tumour has penetrated between them, so that they run quite laterally; lower down they advance anteriorly, to the testicle, so that they would probably have been divided by prolonging the incision through the whole length of the sac, particularly if it had been directed a little to one side.

Many examples of similar separations will be found in the records of surgery. The vas deferens has passed on one side of the sac, while the spermatic vessels ran on the other; the former part being on the inner, while the latter were on the outer side of the tumour: such at least was the distribution in the six cases cited below.† The vas deferens has been found on the anterior and inner, while

* *Sull'ernie*, Mem. i. sect. xxiv.

† COOPER, *part I.* pl. 5, fig. 5. POTT's *Works*; vol. ii. p. 68.

‡ CAMPERI, *Icones herniarum*; tab. viii. fig. 1 and 2; tab. xiii. fig. 1. SCARPA; tab. iii.

the vessels were placed on the posterior and outer part of the rupture.* In a case of large scrotal hernia, of which the history was sent to Sir A. COOPER, with the diseased parts, by Mr. SHEPPERD of Worcester, the spermatic artery and vein were placed on the inner side, the vas deferens in front of the swelling. The latter was divided in the operation.† Mr. HEY informs us, that he had twice seen the vas deferens lying on the anterior surface of the hernial sac, and that he once divided it in the operation.‡ In other instances the vessels have been seen before, and the vas deferens behind, the sac.§

A case, in which Sir A. COOPER found this arrangement, is interesting, as showing that the component parts of the cord may be separated even by a small hernial tumour. “ I was desired to see a boy, a patient of Mr. CLARKE, surgeon in the Borough, who had a tumour which extended from the upper part of the scrotum through the abdominal ring along the cord to the abdomen. The lad’s father was anxious for the removal of the disease, but on examination, it did not project sufficiently to enable me to judge whether there was either fluctuation or transparency. However, as it interfered with the boy’s usual occupation, I resolved to cut down upon it with extreme caution. When I had reached, by incision, the surface of the cyst, I found the spermatic vessels running upon it, and was obliged to open the cyst by its side to avoid these vessels. The cyst contained a portion of the small intestine, everywhere adhering to its inner surface, which had prevented the return of the bowel into the abdomen. The vas deferens could be discerned behind the sac ; so that this was a hernia, the sac of which had insinuated itself between the spermatic blood-vessels and the vas deferens.” ||

When gradual enlargement of the rupture has caused a separation of the parts composing the cord in the manner now described, the spermatic vessels, the vas deferens, or both, may come forwards so as to be placed in front of the

* CAMPER, tab. viii. fig 2. MONRO, *Morbid anatomy of the gullet, &c.* Pl. xvii. In the latter figure the vas deferens is represented running in front of the sac through nearly the whole length of the tumour.

† *Part i.* p. 15, 2nd ed.

‡ *Practical Obs.* p. 140, 3rd ed.

§ CAMPER, tab. viii. fig 1 : the vessels on the anterior and outer, the vas deferens on the posterior and inner, part of the sac.

|| COOPER, *part i.* p. 16, ed. 2.

swelling towards its lower part. It is probably this arrangement that has given rise to the representation of the cord being sometimes found in front of the sac.* We can hardly suppose it possible that the entire cord should run in front of the hernia in its whole length; and certainly such an arrangement has never been ascertained by dissection.

Mr. KEY, however, has recorded a case in which two inguinal herniæ existed on the same side, one of them being behind the spermatic cord. One was an ordinary congenital rupture, and was returned easily. The symptoms of strangulation continued, and a small tumour was felt in the course of the inguinal canal, which was cut down upon and exposed without its nature being discovered. After death this tumour was found to be a hernial sac situated behind the cord, and containing a portion of mortified intestine.†

When the hernia has completely separated the spermatic vessels and the vas deferens, it may pass behind the testicle in its further increase, so that the latter organ will be found in front of the swelling at its lower part. I have seen a few instances of this arrangement, in which the testicle formed a conspicuous prominence on the anterior and lower part of the rupture. In operating on a large scrotal hernia of the right side, Mr. GOYRAND, of Aix, met with the lower part of the spermatic cord and the testicle in front of the lower part of the swelling. The vessels passed along the outer, the vas deferens on the inner side of the tumour, to unite again behind the neck of the sac.‡

In operating lately on a strangulated congenital hernia of the right side, in ST. BARTHOLOMEW'S Hospital, I found the entire spermatic cord and the testicle in front of the swelling. The incision was made in the usual manner, along the middle line, over the ring and the upper part of the tumour. Observing that the inner lip of the incision appeared thick, I examined it, and immediately recognised the cord with its vas deferens. This led me to examine the continuation of the sac downwards, which had not yet

* LE DRAN, *traité des opérations*, p. 127.

SCHMUCKER *vermischte chirurgische Schriften*, vol. ii. p. 55: two instances are mentioned.

Mr. T. BLIZARD, in COOPER, part i. p. 66. ed. 2.

† COOPER, part i. ed. 2, p. 83, note.

‡ *La presse médicale*; March 1837.

been exposed, and I thus found that it was a congenital rupture with the testicle in front. The patient's death afforded an opportunity of examining the parts. From the testicle situated in front of the swelling, the entire cord passed along the middle and anterior part of the rupture to within an inch of the ring, when it turned inwards to enter the abdomen in its usual relative position to the neck of the sac.

Since the vas deferens, from its dense structure, cannot be expected to yield readily to distension, it may draw the testicle forwards, when it is displaced towards the front of the sac, and we may thus account for the testicle appearing in front of the swelling at its lower part, where it forms a conspicuous prominence, instead of being below and rather behind the tumour.

Course of the Epigastric artery, and its relative position to the mouth of the sac.—When we consider that the epigastric artery in the natural state goes first behind the spermatic cord, and then along the inner margin of the upper opening, and that the viscera are protruded over the cord, it will immediately appear, that, in the case of bubonocoele which we are now considering, the parts are protruded on the outer side of the artery, and that this vessel must be situated first behind the neck of the sac, and then on its inner side.* This is so precisely the case, that, if we examine the mouth of the sac towards the abdomen, its inner margin (the *mesial*, or that which is situated towards the pubes) seems to be actually formed by the course of the artery. It retains always the same situation in respect to the mouth of the sac: but the approximation of the upper to the lower opening brings it nearer to the pubes.† In

* CAMPER, tab. v. and xii; SCARPA, tab. iii.; HESSELBACH, tab. ix. compared with tab. vi., representing the course of the vessel in the natural state. Compare also the three first of SCARPA's beautiful plates; and the two sides of the figures in Sir A. COOPER's vii. viii. and ix. plates; in which the same contrast is seen.

LANGENBECK's xvi. plate represents a case of double inguinal hernia; external on one side, internal on the other; with the difference in the course and situation of the epigastric artery.

† LANGENBECK, tab. xxiv. The relative position of the epigastric artery to the mouth of the sac in a recent inguinal hernia, and the change which it undergoes in the progress of the complaint, by being pushed towards the pubes and forming a semi-circular sweep, of which the convexity approaches to that bone, are well exhibited in contrast in the iv.th plate of Sir A. COOPER's work, *Part i.*; which is an internal view of the parts in a case, where there was an incomplete inguinal hernia on one side, and an old complete one on the other. The vii. viii. and ix. plates represent cases of double her-

the natural state, it is about two inches and a-half from the symphysis, at the part where it bends along the inner margin of the opening; its distance from the same point, at the corresponding part, in a bubonocoele now before me, is only three quarters of an inch.

The situation of this vessel, in relation to the neck of the hernial sac, is a point on which great variety of opinion has subsisted among surgical writers: this may have arisen in some degree from the actual variation in the position of the artery in the different forms of the complaint: but the chief cause has been that the anatomy of the parts, particularly in their altered state, had not been sufficiently investigated. Thus RICHTER* supposes that the artery is found near the external angle of the ring in ruptures, as well as in the sound condition of the parts; and he supports his opinion by stating, that the vessel was divided in the dead subject, by cutting upwards and outwards, and never by directing the incision towards the linea alba. It is clear, that these observations can only apply to the healthy state of the parts. CAMPER† has noticed the change of situation which this vessel undergoes in inguinal hernia:—"In herniis igitur inguinalibus, arteria et vena epigastica versus pubem a prolapsis intestinis compelluntur." CHOPART and DESAULT not only knew the ordinary situation of the artery in bubonocoele, but were acquainted with the more uncommon case which will be presently described, in which it is found near the external angle of the ring. "Messrs. CHOPART et DESAULT admettent l'artère épigastrique au côté interne de l'anneau, et rarement au côté externe dans le cas de hernie."‡ This statement is confirmed by the testimony of ROUGEMONT,§ who adduces his own experience on the subject, and rightly adds, that when the artery is on the outside of the ring, the spermatic cord is situated on the outside of the hernial sac. The variation in the course of the vessel is also correctly stated by SABA-

nia, an external on one side, an internal on the other. We here see that the epigastric artery pursues its natural course in the latter, and that it undergoes a considerable change in the former. It comes nearer to the symphysis pubis in the one instance than in the other by almost two inches. The same points are illustrated in fig. 1 and 2 of plate xii.

* *Traité des Hernies*, p. 123.

† *Demonst. Anat. Pathol.* lib. ii. p. 5.

‡ ROUGEMONT, in a note to his translation of RICHTER, p. 124.

§ *Ibid.* p. 124.

TIER.* The correctness of the opinions entertained by CAMPER, DESAULT, ROUGEMONT, and SABATIER, is fully confirmed by the more ample experience and extensive researches of COOPER and SCARPA, with whose descriptions those of HESSELBACH and CLOQUET entirely coincide.

Dissection of the external inguinal hernia.—A person, who is not well acquainted with the anatomy of the abdominal muscles, will find a difficulty in understanding the preceding account. A clear notion of the subject cannot be conveyed by mere verbal description, to a person previously unacquainted with it. In order to acquire a satisfactory knowledge of the parts, a careful investigation of them, both in their healthy and diseased state, must be combined with a reference to the best plates and descriptions. It may, however, facilitate the progress of a beginner, to enumerate the parts as they are met with successively, in dissecting a hernia from the surface downwards.

The removal of the integuments exposes the exterior investment of the hernial tumour formed by the fascia superficialis, continuous with the margin of the ring, and sometimes containing tendinous fibres from the aponeurosis. Then comes the cremaster, and afterwards the close and compact investment of the tunica vaginalis communis. This is connected by cellular substance to the proper hernial sac formed of the peritoneum. We may dissect away the fascia superficialis, so as to expose the aponeurosis of the obliquus externus and the external abdominal ring. The hernia will then be seen issuing through the latter, and covered by the cremaster in the shape of a layer of thin expanded muscular fibres. When the aponeurosis of the external oblique has been detached from the crural arch, in the manner described in the first section of this chapter, the hernial sac is seen passing through the lower opening of the canal, and then continued upwards and outwards, still covered by the cremaster. Behind and above the ring, the inferior margin of the obliquus internus and transversus crosses the neck of the sac. When these muscles and the cremaster are reflected towards the linea alba, the production of peritoneum immediately investing the protruded parts is exposed, together with the fascia ascending from POUPART's ligament, and forming the upper opening of the inguinal canal; and the epigastric artery is dis-

* *Médecine opératoire*, tom. i. p. 92.

covered, emerging from the inner side of the mouth of the hernial sac,* which, at this precise point, becomes continuous with the peritoneum lining the abdomen. By dissecting the peritoneal process from its posterior and lateral connexions, and turning it up towards the abdomen, we shall lay open the course of the spermatic cord through the inguinal canal and in its descent to the testicle: when this is also elevated, the first part of the course of the epigastric artery, and its origin from the iliac trunk, are exposed.†

Seat of stricture.—In the species of bubonocoele now described, the cause of strangulation may exist in the upper aperture of the inguinal canal, or in the lower aperture, or in the neck of the sac. According to Sir A. COOPER,‡ the first is most frequent in recent and small herniæ, the second in old and large ruptures. The stricture may occur in the upper orifice, where the parts have passed the ring completely, the tendon of the obliquus externus remaining loose and free: a rupture may also be strangulated by both openings at once.

In some of the cases, described as strictures in the neck of the sac, strangulation may probably have been caused by the margin of the upper opening. That the parts, forming this opening, may produce a state of incarceration is easily understood; but a soft and extensile membrane, like the peritoneum, which yields to any impelling or distending force, cannot form a stricture on the prolapsed viscera, unless it should have been previously thickened and indurated. BERTRANDI§ directly asserts, that the transversus and internal oblique sometimes cause strangulation. That some of the instances related by others are of the same nature is rendered probable by this circumstance, that the stricture is generally said to have been at some distance within the ring of the external oblique. In three cases which occurred to Mr. WILMER,|| the stricture was

* CAMPERI, *Icones*, tab. x. F. M.

† The work of CAMPER exhibits these facts very clearly: see tab. v. ix. x. and xii. See also the first three plates of SCARPA.

‡ Page 21.

§ *Traité des Operations*, p. 30.

|| *Practical Observations on Hernia*, p. 3 and 15. In the advertisement to the second edition, Mr. WILMER expresses himself strongly as to the frequent occurrence of stricture in the situation we are now considering. "In one-third of the cases, in which the author has been obliged to have recourse to the knife, the cause of strangulation was in the neck of the hernial sac; and he is convinced, that if the inexperienced operator considers the stricture to be found only in the tendinous openings of the abdominal muscles, many lives must be unavoidably lost. He was early led to the consideration of this

more than a inch higher than the external opening of the tendon. ARNAUD* found a stricture two inches behind the ring, and LE DRAN has a similar observation.† Mr. HEY‡ was obliged to divide the ring pretty freely in order to get at the internal stricture.

In the first chapter of this work § I have mentioned, that a process of thickening and induration may take place in the mouth of the sac: and I have stated further, in the fifth chapter, that such a change will be promoted by the pressure of a truss. The neck of the sac, thus altered, is hard and unyielding, and quite capable of strangulating the protruded parts. This is the seat of stricture in many cases, when the tendinous openings exert no pressure on the rupture.|| The confinement, in such instances, is found at a greater or less distance within the ring of the external oblique muscle. Whether the neck of the sac, or the border of the upper opening, form the stricture, the practical observation is the same; viz. that we often find the tendon of the external oblique quite free, while the obstacle, which prevents the return of the parts, is situated further in towards the abdomen; and that there may be a stricture in this latter situation combined with one of the former kind.

subject, having seen the intestine burst by the rude efforts made to return it after the opening of the external oblique muscle had been dilated, in two cases, where the operation for strangulated hernia was performed during his attendance at the London hospitals."

* See his remarks, "*Of the Strangulation of the Intestine by the Peritoneum*," p. 353, et seq.

† *Observations*, p. 60.

‡ *Practical Observations*, p. 174.

§ See *ante*, p. 26.

|| Mr. WILMER says, that on passing the finger into the tendon of the external oblique, a stricture will often be found an inch higher in the neck of the hernial sac." "This stricture is annular, is sometimes thick and cartilaginous." Ed. 2. p. 41.

Sir E. HOME divided the ring of the external oblique ineffectually; on opening the tumour, he found the intestine "closely embraced by the orifice of the sac." *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, vol. ii. p. 106.

SECTION III.—INCOMPLETE EXTERNAL INGUINAL HERNIA ;
i.e. INGUINAL HERNIA, IN WHICH THE PROTRUSION, NOT
 PASSING THROUGH THE EXTERNAL ABDOMINAL RING, IS
 CONTAINED IN THE INGUINAL CANAL. INTRA-INGUINAL
 HERNIA ; BOYER.* HERNIE INGUINO-INTERSTITIELLE ;
 GOYRAND.†

Although this form of inguinal hernia has not been well understood and clearly described until lately, it had not entirely escaped observation. LE CAT‡ mentions two cases of inguinal ruptures where the aponeurosis of the external oblique muscle covered the tumour.

PETIT § had a tolerably clear notion of the anatomy, as the following quotation will prove: “ Mais ce qui me fait croire que les hernies qui paroissent en cet endroit, ne se font pas toutes par l’anneau, c’est que j’en ai vu plusieurs situées sous l’aponevrose du grand oblique ; de sorte que les parties, apres avoir poussé le peritoine au-delà du muscle transverse et de l’oblique interne, n’ayant pu forcer l’anneau de l’oblique externe, s’étoient réfléchies entre cette aponevrose et l’oblique interne, et y formoient une tumeur large et plate.”

CALLISEN || mentions an instance in which the rupture was of this kind ; although ROUGEMONT, who notices it in

* *Traité des Maladies Chirurgicales* ; tom. viii. p. 226.

† Mr. GOYRAND published an account of this hernia in the fifth volume of the *Mémoires de l’Académie de Médecine*, 1836 ; and is anxious to establish his priority over M. DANCE, who wrote a thesis on the same form of the complaint, under the name of *intra-parietal*, within a few months of the same time. The contest for the honour of the discovery might have been spared, as the principal peculiarities of the case had been noticed long ago by LE CAT, J. L. PETIT, MURRAY, and CALLISEN, and all the circumstances had been not only described, but delineated by Sir A. COOPER in the year 1804.

‡ *Philos. Trans. abridged*, vol. x. p. 221.

§ *Traité des Mal. Chirurg.* tom. ii. p. 247.

|| *Acta Societatis Medicæ Havniensis*, vol. ii. The following statement is given by ROUGEMONT:—“ Une petite hernie crurale recente fut sur le champ si fortement étranglée, que M. CALLISEN pratiqua l’opération. Après avoir incisé la peau, il ne trouva point de hernie sous le ligament de Fallope, mais l’aponevrose de l’oblique externe, au dessus de ce ligament étoit distendue en une tumeur de la grosseur d’un œuf de pigeon. Il incisa longitudinalement, et y trouva une portion d’intestin très inflammée.” *Tr. des Hernies*, p. 504, *Addition*, No. 9.

the additions to his translation of RICHTER, has so totally mistaken its nature as to call it a crural hernia.*

We are indebted to Sir A. COOPER for the first clear description of this case. In the first part of his work, CHAPTER XIV. he points out the distinguishing characters of the swelling; and he has illustrated the anatomical facts in the 3rd, 4th, 5th, and 6th plates. "This tumour," says he, "occurs much more commonly than is usually supposed; for I have frequently found it in the dissection of bodies of persons who have never been suspected of labouring under the disease, nor ever wore a truss. When strangulated, these cases more commonly fall under the care of the physician than the surgeon; for, as the patient himself is often not conscious of having a tumour at the groin, the symptoms of strangulation are ascribed to inflammation of the bowels, without a suspicion of the true cause having been excited, and the patient dies, as is supposed, of idiopathic peritonitis.

"A man was admitted into ST. THOMAS'S Hospital with symptoms of strangulated hernia, which for five days had been treated as a case of simple inflammation of the bowels, without a suspicion of the true cause having been excited. On examination, a fulness could be perceived above POUPART'S ligament; and when this was compressed, a small tumour, like the end of the little finger, appeared at the abdominal ring, which again receded to its former place, on withdrawing the pressure. Pain was felt at the same time, and on coughing much uneasiness was produced at that spot. As five days had elapsed between the first accession of the symptoms and his admission into the hospital, the performance of an operation afforded but little prospect of success; for, besides vomiting, he had been troubled with a hiccup for forty hours, his belly was sore on pressure, and his pulse so small as scarcely to be distinguishable. However, as it was the only possible chance for recovery, the operation was undertaken. On cutting down to the tumour it was found to be produced by a hernial sac an inch and a half long, and when this was

* MURRAY mentions the existence of incomplete herniæ, which have not come through the obliquus externus (p. 79); and strangulation by the transversus and obliquus internus, p. 13. *Diss. Animadversiones in Hernias Incompletas, casu singulari illustratæ*; Upsal. 1788. SCARPA also describes the small herniæ, which do not pass the ring of the obliquus externus, but are covered by its aponeurosis. M. i. § 17.

opened, about half the circumference of one of the small intestines was found to be contained within it, together with a quantity of sanious serum. The stricture, which existed an inch and a half above the abdominal ring, was then divided. The intestine was discoloured, but the point of the knife having accidentally touched one of its superficial veins, blood issued from it freely, proving that the bowel was in a fit state to be returned; which was accordingly done as soon as the bleeding ceased. The patient had stools in twelve hours, and, although he afterwards suffered from a severe purging, he ultimately recovered.”*

Description of the rupture.—This rupture begins, like the preceding, by the protrusion of the viscera at the internal abdominal ring, over the spermatic cord, into the inguinal canal. As they do not overcome the resistance of the lower opening, the tumour is contained in the canal. The cremaster, the spermatic and the epigastric vessels have the same relative position in this, as in the complete external inguinal hernia; that is, the fibres of the former are spread over the peritoneal sac on its anterior aspect, the spermatic vessels run along its posterior surface, and the epigastric artery is found on the inner or pubic side of its mouth. The tumour is covered externally by the aponeurosis of the obliquus externus; its opposite or internal surface rests on the fascia transversalis: it is bounded, below, by the crural arch; above, by the inferior margin of the obliquus internus and transversus, of which the fibres are more or less raised.

The resistance which the aponeurosis of the obliquus externus and the fascia transversalis may be expected to oppose to the development of a tumour in the narrow space left between them, and the ready passage of the protrusion, as it increases, through the external abdominal ring, will account for the incomplete inguinal hernia being usually small. The protruded parts, however, although bound down by the external oblique aponeurosis, so that they do not constitute an external swelling, gradually separate the sides of the inguinal canal, which yields towards the abdomen, and extends sometimes considerably beyond the limits of that canal. Hence, on operation or dissec-

* *Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*; Edit. 2, p. 65.

tion, we find the hernial tumour larger than we should have expected. There is a preparation in the museum of ST. BARTHOLOMEW'S Hospital, taken from the body of a person in whom the existence of a rupture had not been discovered during life, although the inguinal region had been carefully examined, as the symptoms were those of strangulated hernia. A bit of intestine, not larger than the tip of the finger, just projects under the lower edge of the obliquus internus and transversus; but the body of the swelling forms a prominence in the cavity of the abdomen nearly equal to the last joint of the thumb, and the stricture formed by the mouth of the sac is on the summit of this prominence, about an inch within the lower margin of the transversus. In a case, on which M. GOYRAND operated, he observes that the inguinal region, on the first view, presented no abnormal appearance, but that an oval tumour, seated under the aponeurosis, was recognised by the touch. When the operation was performed, the sac was found to contain a portion of small intestine, six inches in length. The case terminated fatally: the sac extended for fifteen lines beyond the commencement of the inguinal canal, in the direction of the spine of the ilium: in the opposite direction, it reached nearly to the ring of the obliquus externus.*

The incomplete inguinal hernia sometimes increases to a considerable magnitude within the abdominal parietes. F. K. HESSELBACH † represents in his eighth plate a large hernial tumour, which had penetrated the upper opening of the canal in a female, and had increased between the aponeurosis of the external oblique, and the internal oblique muscle, extending from the anterior superior spine of the ilium to the external abdominal ring, which it had not passed.

Dr. MONRO ‡ met with a case "in which the internal tumour at the upper abdominal aperture was as large as an orange. The contents of the tumour could not be drawn into the abdomen, until the upper abdominal aperture was slit up, on account of the enlargement of the included omentum, which adhered firmly to the protruded intestines."

I dissected, in a female, a large inguinal rupture, which

* *Lib. cit.* p. 15—18.

† *De ortu et progressu herniarum*, &c. p. 26. pl. viii.

‡ *Morbid anatomy of the human gullet*; p. 465.

was partly contained within the abdominal parietes, and had partly descended through the external abdominal ring. The aponeurosis of the obliquus externus was distended by a swelling equal in bulk to two fists, and a tumour of the size of an egg had escaped from the inguinal canal at its lower aperture. On turning back the tendon, it appeared that both these were parts of one hernial sac, which had been protruded at the upper opening, in the usual course, had increased to a large size in the canal, and had afterwards passed partially through the lower aperture.

M. GOYRAND* operated on a strangulated congenital bubonocoele, which formed a voluminous tumour under the aponeurosis of the obliquus externus, and sent a prolongation through the external ring. The swelling, which had existed from infancy, had not been restrained by any kind of bandage. Commencing about an inch in front of the anterior superior spine of the ilium, it extended obliquely to the upper part of the scrotum; the scrotal being separated from the upper or abdominal portion by a depression corresponding to the situation of the external ring. The greatest diameter measured five inches; it was three inches across at the middle, and projected an inch and a half. The operation was performed, and it was necessary to slit open the aponeurosis of the obliquus externus in the whole length of the tumour, which contained a large mass of omentum, four inches of small intestine, and the testicle. The patient recovered.

The seat of stricture, when this rupture is strangulated, is either the internal abdominal ring, more particularly the inferior margin of the transversus, or the neck of the sac.

A complete and an incomplete external inguinal hernia may exist together on the same side; the combination being, as we might expect, extremely rare. I have never seen it; and know no other recorded instance but that related by Mr. KEY, in which a small protrusion had become strangulated in the inguinal canal, while there was an ordinary congenital rupture on the same side.†

* *Lib. cit.* p. 18—21.

† See *ante*, p. 214.

SECTION IV.—INTERNAL OR DIRECT INGUINAL HERNIA *
(VENTRO-INGUINAL.)

I have explained already, that the space left above the pubes, between the two columns of the aponeurosis of the obliquus externus, through which the spermatic cord quits the inguinal canal, is closed behind by the fascia transversalis, connected to the tendon of the transversus and obliquus internus, near its insertion in the pubes, and to the outer margin of the rectus. When the size and position of the opening in the aponeurosis are considered, we can hardly doubt, that ruptures would take place through it much more frequently, were they not prevented by this structure. Yet their formation is not entirely obviated. We have the parts protruded under the edge of the transversus, and then through the lower opening of the abdominal canal. Such ruptures occur, according to Sir A. COOPER,† “if this tendon (*viz.* that of the transversus) is unnaturally weak; or if, from malformation, it does not exist at all; or, from violence, has been broken.” I lately dissected a hernia of this species, where the fascia was neither thinner than usual, nor separated by violence; but it had been protruded before the peritoneum, and formed a thick aponeurotic covering to the hernial sac.‡

In a case examined by Mr. KEY, “the fascia transversalis had been protruded before the peritoneum, so that the intestine was contained in a double sac, and between the two a layer of adipous structure was interposed, in the same manner as we often find it in the healthy state.”§

In passing from its origin to the rectus muscle, the epigastric artery circumscribes externally a triangular space, of which the crural arch is the basis, and the margin of the rectus the internal boundary. (See *ante*, p. 201.) Through the lower part of this space, which is

* SCARPA, M. i. § xxv. The situation of the opening, at which the hernia protrudes, and of the epigastric artery, is clearly shown in HESSELBACH’S tab. x. and xi.

† *Lib. Cit.* p. 51. SCARPA also ascribes them to weakness and flaccidity of the aponeurosis in the inguinal region; M. i. § xxv.

‡ “The sac of the internal inguinal hernia either pushes before it, and thus receives a covering from the fascia transversalis, or passes through an opening of that fascia.” J. CLOQUET, *Rech. Anat.* p. 83.

§ *London Medical Gazette*; vol. iv. p. 197.

larger in proportion as the epigastric artery is farther from the pubes, the internal inguinal rupture is protruded.

Since the spermatic cord lies on the outer column of the aponeurosis of the obliquus externus, and this rupture comes directly over the pubes, the former part is placed on the outer side of the sac; more particularly at the point of protrusion. But I have seen the cord behind the sac, as in the more ordinary form of the complaint. The epigastric artery is situated on the outside of the mouth of the sac. Its course is not disturbed by the rupture; and it is consequently found, as in the natural state, at about three-fourths of an inch from the upper and outer extremity of the lower opening of the inguinal canal.*

Since the parts are protruded, in this case, in so different a direction from that which they pursue in the two species last described, the sac is not covered by the cremaster muscle. I have, however, seen that muscle expanded over the swelling. How often it may be invested by a protrusion of the fascia transversalis, I cannot hitherto determine.† Mr. STANLEY has found it thus covered in several instances: and has placed some specimens illustrative of the fact in the museum of ST. BARTHOLOMEW'S Hospital.

In dissecting this species of rupture, the spermatic cord,

* COOPER, pl. vii. viii. ix. x; SCARPA, pl. i; HESSELBACH, tab. xi; LANGENBECK, tab. xvi. xvii. xviii. and xix.

HESSELBACH met with an internal inguinal hernia in a female, in whom the epigastric and the obturator artery arose, as they frequently do, by a common trunk from the external iliac. The epigastric separated from the common trunk at an inch from its origin, passed behind the neck, and ascended along the inner side of the mouth of the sac. *Disquisitiones Anat. Pathol.* p. 15. The case is also described by A. K. HESSELBACH, *Lehre, &c.* p. 67; who, in another instance, found the epigastric artery running so near to the symphysis pubis, in its course to the rectus abdominis, that, if an internal inguinal hernia had occurred, the vessel would have been found on the inside of the mouth of the sac. *Ibid.*

† LANGENBECK asserts that this is the regular and constant arrangement. "Quia hernia inguinalis interna non in canalis abdominalis aperturam internam transit, tunicam vaginalem communem intrare nequit; *parietem* autem *canalis abdominalis internum aponeuroticum*, in quo fovea inguinalis interna, (the internal fossa of the peritoneum, see p. 180,) et qui ex adverso annulo abdominali est, *ante se per annulum trudit*. Hernia tum inter obliqui interni fibras musculares, ad spinam ossis pubis transeuntes, et cremasterem sita est. Illæ supra sacci hernialis collum positæ sunt, et in parte ejus exteriori cremaster jacet. Atqui quoniam hæc hernia, ut per annulum transire possit, canalis parietem internum expellere debet, multo rarior quam externa est, et quia paries ipsi egredienti obstat, nunquam tantam quantum externa, magnitudinem assequitur. Parietis interni canalis fibras separari, ut in hernia ventrali, nunquam observavi, *sed saccum hernialem semper ab eo obtectum inveni*. *Commentarius*, § cv; tab. xvii. xviii. and xix.

covered by its muscle, is found at the outer side of the sac. The latter part goes directly upwards, instead of upwards and outwards. The reflection of the obliquus externus exposes the lower edge of the obliquus internus and transversus, crossing the neck of the sac immediately behind the lower aperture of the inguinal canal. By turning these aside, the continuity of the sac with the abdominal cavity is exposed just over the pubes, and the passage of the epigastric artery, at about half or three quarters of an inch on the outside of the mouth of the sac, is brought into view. The spermatic cord has no connexion with the rupture behind the tendon of the obliquus externus.

The latter part, the edge of the obliquus internus and transversus, or the neck of the sac, may be the seat of stricture in the internal inguinal hernia.

Sir A. COOPER's work* contains the first description of this hernia, which can be deemed complete or accurate: but its existence had been noticed previously. CAMPER † seems to have met with an instance of it so early as the year 1759; Mr. CLINE ‡ dissected a case in 1777; and there is a preparation of the kind in the museum of ST. THOMAS'S Hospital, made by Mr. BAYNHAM more than fifty years ago.§ CHOPART and DESAULT || had probably observed it frequently, as they direct the incision of the ring to be varied according to the course of the epigastric artery. ROUGEMONT ¶ had seen one example. It is very clearly described and delineated by SCARPA.**

The exact proportion, in point of number, between this kind of ruptures, and those of the species first described, has not been hitherto ascertained; it only appears that the latter are by far the most frequent.††

* Chapter xv.

† *Edinburgh Review*, vol. i. p. 465.

‡ COOPER, pt. i. p. 51.

§ COOPER, *ibid.*

|| *Traité des Mal. Chirurg.* tom. ii. p. 263.

¶ RICHTER, *Tr. des Hernies*, p. 125; note.

** *Mem. i.* § xxv. and xxvi.; and pl. i.

†† In a great number of dead bodies of persons affected with hernia, SCARPA met with very few instances of the internal inguinal kind. *M. i.* § xxvi. Five examples occurred to HESSELBACH, in a very short time. *De Ortu et Progressu Herniarum*, &c. p. 52. He asserts further, that out of one hundred inguinal herniæ more than ninety are external, quoting for the statement BRÜNNINGHAUSEN *Unterricht über die Brüche, den Gebrauch der Bruchbänder*, &c. Würzburg, 1811. *Disquis. anat. de ortu et progressu herniarum*; p. 25. M. J. CLOQUET states the proportion of internal or external herniæ at 1 to 5. *Rech. Anat.* p. 84.

Incomplete internal inguinal hernia.—As the parts, in internal inguinal hernia, are protruded directly from behind forwards, in a situation where the abdominal parietes are thin, this rupture has been hitherto known and described only in the complete form. The following cases, noted by M. GOYRAND, show however that the viscera may be protruded through the fascia transversalis on the inner side of the epigastric artery, and yet pass into the inguinal canal, so as to form a swelling covered by the aponeurosis of the obliquus externus. The possibility of such an occurrence should be borne in mind, in order to avoid injuring the epigastric artery, if an operation should become necessary in a case of this description.

CASE I.—“ I dissected lately the body of a female fifty years of age, who had an epiplocele, as large as a pigeon's egg, in the inguinal canal. It had taken place through an opening in the fascia transversalis between the epigastric vessels and the cord of the umbilical artery. It was covered in front by the lower fasciculi of the obliquus internus; above, by some fibres of the same muscle, and by the lower edge of the transversus. The aponeurosis of the obliquus externus was not raised by it. The opening in the fascia transversalis was circular, and six lines in diameter: it was situated about the middle of the posterior wall of the inguinal canal. The epigastric artery passed at two lines and a half from its outer and upper side. I discovered this rupture accidentally; it had caused no symptoms, and its existence could not have been suspected previous to dissection.”

CASE II.—“ I saw a hernia of the same kind, which had commenced in the internal inguinal fossa. The patient, eighty years of age, had inflammation of the spermatic cord, with vomiting; the stools were not completely suppressed. A hernia, as large as a walnut, was found in the wall of the abdomen, behind the inguinal ring. The sac contained a brownish serosity, and a portion of ileum equal in size to a filbert, the intestine being merely pinched, so that one-third of its calibre was free. It had been protruded through a circular opening in the fascia transversalis, three lines in diameter. The hernia caused no external swelling, and its existence had not been suspected, the pain experienced in the part having been referred to the inflamed spermatic cord.”*

* *Mémoires de l'académie de médecine*; tom. v. p. 25.

SECTION V.—INGUINAL HERNIA OF FEMALES.

The inguinal canal of the female resembles that of the male in position and construction. It is traversed by the round ligament of the uterus, which bears the same relation to the two apertures in the abdominal parietes, and to the intermediate canal, as the spermatic cord does in the male. Since the ligament is smaller than the cord, the dimensions of the canal and of its openings are proportionally less in the female; the external abdominal ring is less by one half than in men. Hence women are less subject to inguinal herniæ, as will appear on consulting the enumerations in CHAPTER I. SECT. 2, and in the notes to CHAPTER II. Of 885 individuals affected with inguinal hernia, examined by MONNIKHOF,* 710 were males, 175 females.

The *external* or *oblique inguinal hernia* bears the same relation to the inguinal canal and to the round ligament of the uterus that it does to the spermatic cord: the anatomy of this rupture, therefore, in all essential points, is the same in both sexes. The external covering of the hernial tumour is thinner and less compact, since there is nothing in the female corresponding to the cremaster and the tunica communis of the cord.

This rupture most frequently contains intestine and omentum, as in the male. Sometimes the uterine appendages are met with in it. Sir A. COOPER† placed in the museum of GUY'S Hospital an external inguinal rupture containing the ovary and Fallopian tube. A. K. HESSELBACH‡ saw the ovary, Fallopian tube, and broad ligament drawn into such a rupture, so as to constitute part of the sac.

Incomplete external inguinal hernia may occur in the female. The external abdominal ring, which is so much smaller than in the male, resists the progress of the rupture externally, and occasions it to enlarge in the inguinal canal, where it may cause considerable swelling, distending the aponeurosis of the obliquus externus. F. K. HESSELBACH§ dissected a case of this kind in a female, where an incomplete external inguinal hernia had attained a considerable magnitude under the aponeurosis, forming

* A. K. HESSELBACH, *Lehre*, &c. p. 112.

† Pt. i. p. 71.

‡ *Lehre*, &c. p. 128.

§ *Disquisitiones anat. pathol.* p. 26. The parts are represented in tab. viii.

an oval tumour, of which the external extremity ascended to the anterior superior spine of the ilium, while the internal nearly reached the pubes. The parts are figured in the eighth plate.

A case of internal or direct inguinal hernia, which I dissected in the female, differed in no essential point from the same rupture as it is seen in the male.

SECTION VI.—INGUINAL HERNIA, IN WHICH THE FIXED PORTION OF THE CÆCUM, OR THE SIGMOID FLEXURE PASSES THROUGH THE RING.

These portions of the large intestine are partly loose, and may be protruded in ruptures, like any other of the floating viscera : the swelling then comes under the common description in its origin, anatomy, and treatment. But the subject of the present section is the descent of that portion of the cæcum and neighbouring colon, on the right side of the body, of the sigmoid flexure and descending colon, on the left side, which are naturally fixed in their respective situations, *viz.* in the right and left ileo-lumbar excavations of the abdomen.

These protrusions are not very rare ; many examples of them are recorded, and have been noticed principally on account of the embarrassment which the unexpected adhesions of the parts presented in operations.* In general, they have been spoken of incidentally, and in detached cases. SCARPA † has entered into the consideration of the subject at great length, and has explained it satisfactorily. PELLETAN,‡ who had seen many cases, also gives a right view of the matter : the same remark applies to HESSELBACH § and to J. CLOQUET.||

* ARNAUD, *Dissertation on Hernias* ; pt. ii ; obs. xvii.

PETIT, *Mem. de l'acad. de chirurgie* ; tom. iv. p. 316 ; and *Traité des maladies chirurg.* tom. ii. p. 352.

POTT's *Works* ; vol. ii. p. 61.

MONTEGGIA, *fasciculi pathologici* ; p. 91, et seq.

† *Sull' ernie* ; Mem. ii. § xxix—xli ; and pl. vi. fig. 1, 2, and 3.

‡ *Clinique chirurgicale*, tom. iii. p. 350.

§ “ In herniis scrotalibus, si forte cæcum dextro, colon verò sinistro latere inveniatur, utrumque intestinum parieti sacci hernialis postico proximè atque firmissimè insidet ; neque tamen coalitum putes, sed conformatio potius naturalis habenda. Processus nempe peritonei breviores, qui colon simulque intestinum cæcum parieti cavitatis abdominis postico arcuè adnectunt, intestinorum delapsu haud prolongantur, sed ipsum adeo peritoneum, laxè mus-

The cæcum and the sigmoid flexure do not lie loosely in the peritoneal cavity, surrounded on all sides by a reflected covering of the membrane, like the jejunum, ileum, or transverse arch of the colon; but they are firmly bound down in the lumbar and iliac regions, and covered only partially by reflected peritoneum. Their posterior surface is connected by loose cellular tissue to the lumbar and iliac muscles, kidneys, &c.; the remainder of the tube, covered by peritoneum, appears in the cavity of the abdomen; while that membrane, passing from the sides of the gut to the neighbouring abdominal parietes, fixes it in its situation. This portion of peritoneum, like the adhering posterior surface of the intestine, is connected to the surrounding parts by means of a copious and loose cellular tissue, which can be easily lacerated by the hand, so as to enable us to lift up altogether the peritoneal bag with its contents, and which readily yields, so as to permit the displacement of the parts without any separation of their posterior connexions.

If these facts are borne in mind, the peculiarities of the case now under consideration will be readily understood. The cæcum and the sigmoid flexure, with the neighbouring portion of the peritoneum, descend, retaining their posterior and lateral connexions, as the testis does in the fetus. In its original situation under the kidney, the testis is covered on the anterior and lateral aspects by reflected peritoneum, but adheres posteriorly to the psoas muscle, by means of cellular substance: during the whole of its passage down to the abdominal ring it presents the same appearance, always being connected behind: lastly, when it has reached the bottom of the scrotum, if we lay open the peritoneal process, which forms the tunica vaginalis, we still see the cord and testis attached posteriorly to the bag of the scrotum, as they were to the lumbar and iliac regions of the abdomen, while the peritoneum forms a sac or loose covering for them in front and laterally. In the same way, the hernial sac of these ruptures covers the protruded gut only in front and at the sides, and the gut

culis iliakis internis adhærens, cum ipsis hisce processibus intestinorum sacco herniali contentorum pondere, eorumque vi extendente per canalem inguinalem detrahitur, atque in parietem sacci hernialis posticum efformatur. Herniæ ejusmodi intestina naturaliter conjuncta continentes repositionem haud facile admittunt, atque sub herniotomia separationem vetant." *De orta et progressu herniarum*; p. 34.

|| *Recherches sur les causes et l'anat. des hernies abdominales*; p. 109—112.

itself is connected behind to the scrotum, as it was connected to its natural situation in the abdomen.

When the termination of the ileum, or the sigmoid flexure of the colon passes down, the intestine is accompanied by the mesentery or mesocolon belonging to it. These duplicatures connect the parts more or less loosely to the back of the sac, as they did to their natural situations in the abdomen, and the intestine may admit of partial or complete reduction.

In other cases the cæcum is displaced at its posterior surface, and in its passage through the ring becomes in great measure denuded of the peritoneum, which is loosely connected to it at the sides. Here the hernial sac is small in comparison to the size of the rupture; it may be only one or two inches long in a swelling of five or six inches. When we open the sac in such a case, we find at the back of the cavity a prominence formed by a portion of the circumference of the intestine; while, beyond the limits of this small sac, the muscular coat of the intestine is covered by the cremaster, the tunica vaginalis of the cord, and the spermatic vessels. If the posterior surface only of the bowel should descend, the rupture may be altogether without a sac. "In this case," says M. CLOQUET, "the posterior surface of the cæcum, which is not covered by peritoneum, descends. In going through the ring it is stripped in great measure of the peritoneum, which covers it loosely at the sides. I have dissected large cæcal herniæ, in which the intestine could not be said to be contained in the small sac, which accompanied it through the ring, but simply projected into the cavity as the bladder does in most cystoceles. In the commencement, the hernia may be without a sac; (*akystique* :) that is, the cæcum placed behind the ring may pass through by its posterior surface, without any production of peritoneum."*

M. CLOQUET noted the following circumstances in an external inguinal hernia of the right side, which he found in the body of an old man. "After removing the skin, we met with; 1st, a covering from the fascia superficialis, white, thickened, and containing varicous veins; 2ndly, the cremaster, with its two fasciculi strongly marked, forming arches in front of the swelling; the obliquity of the inguinal canal is destroyed: the aponeurosis of the obli-

* *Recherches sur les causes, et l'anatomie des hernies abdominales*; p. 110, note.

quus externus is considerably dilated, and forms a thick fibrous band, surrounding the base of the swelling; 3rdly, a firm, white, fibro-cellular bag, containing numerous vessels, derived from those of the cord, which is imbedded in its posterior part. This bag is four inches long, and continuous, towards the abdomen, with the cellular tissue of the iliac fossa: below, it is separated from the testicle and the tunica vaginalis by a slight constriction. It contains the cæcum, denuded, for the greater part, of its peritoneum, so that the muscular coat of the bowel is in immediate contact, for considerable extent, with this investment. It also contains the hernial sac. It appears that the intestine, as it passed through the inguinal canal, lost a large part of its serous covering. Although the hernia is of considerable magnitude, the peritoneum constitutes a sac only two inches and a half long, the back of which is formed by the cæcum. The opening of this sac is large, without any thickening, and apparently incapable of producing strangulation. The anterior surface of the cæcum merely projects a little into the sac, the cavity of which is occupied by the appendix cæci and a convolution of small intestine. The epigastric artery and the spermatic vessels are in immediate contact with the posterior surface of the large intestine. The peritoneal sac, and a portion of the cæcum, can be returned into the abdomen by pressure; the lower part of the intestine, however, cannot be replaced; it remains in the scrotum, forming a hernia without a peritoneal sac.”*

CHOPART and DESSAULT† speak of having found the cæcum, uncovered by peritoneum, under the integuments of the scrotum. And, on similar grounds, a writer in a French medical journal‡ speaks of intestinal herniæ that have no sac (*enteroceles akystiques*).

SCARPA§ met with a large scrotal hernia in the dead body, in which he says that the intestine had turned on its axis, so as to present the cellular adherent surface, which is naturally posterior, towards the front of the scrotum. He found the hernial sac on the inner side of the tumour.

Mr. WORMALD informed me, that he had met with two cases of scrotal hernia on the right side, containing the

* *Ibid.* p. 110, note. The parts are represented in pl. iv. fig. 8.

† *Traité des maladies chirurg.* tom. ii. p. 195.

‡ SERVIN in *Journal de médecine par SEDILLLOT*, tom. xvi. p. 302.

§ *Mem.* ii. § 34.

posterior part of the cæcum. The tumour was considerable in both instances. In one, which was operated on, there was no sac; and the unusual state of parts not being understood by the operator caused, as might be expected, great embarrassment. In the other case, there was a small triangular sac, not more than half an inch long, at the upper and front part of the swelling. Mr. W. has since kindly furnished me with the following details of these cases:—

A case of scrotal hernia where no sac or peritoneal covering to the intestine could be found.—A man, aged 45, had laboured under scrotal hernia for several years, without wearing a truss. He was attended by a surgeon in this city, in consequence of symptoms of strangulation, which had existed for three days. The usual means to afford relief were employed without success; hence an operation was deemed necessary. A careful dissection was made through the various coverings to the gut, but no sac or peritoneal coat could be found. In searching for a sac an opening was made into the cæcum, from which fecal matter escaped; until this occurred the operator could not know that he had opened the intestine, as the coats were thickened, and greatly changed in appearance. That the passage of the contents of the bowels might be quite free, the lower margin of the internal oblique and transversalis was divided. In the space of thirty-six hours fecal discharges took place through the wound, but the patient died three days after the operation.

On examination after death, the hernia was found to consist of the inferior and posterior parts of the cæcum, which could not originally have been covered by peritoneum to the usual extent. The portion of intestine had passed behind the peritoneum through the inguinal canal, between the spermatic cord and the cremaster muscle. The appendix vermiformis and the junction of the ileum with the cæcum were close to the internal ring, and it was in this situation that the peritoneum was reflected from the walls of the abdomen to the cæcum.

A case of scrotal hernia, where a great portion of the intestine was not covered by peritoneum.—A subject with a scrotal hernia of considerable size on the right side was brought to the dissecting room during the winter of 1835. In demonstrating to the class the coverings of hernia, I was surprised at not being able to find any hernial sac, as the

coverings were not thickened or changed in appearance, and the muscular coat of the intestine was sufficiently evident. By a careful dissection I found that a considerable portion of the cæcum had passed through the inguinal canal between the cord and the cremaster, and that the great mass of the intestine was not covered by peritoneum. Protruding through close to the external ring, there was a hernial sac half an inch in length, which afforded a peritoneal covering to the intestine in this situation. The relations which this hernia held with regard to the parts around were the same as in common oblique inguinal hernia.

This kind of descent is sometimes a secondary occurrence, taking place in addition to a hernia of the common sort, and as a consequence of its increase. When an ordinary rupture is enlarging, the peritoneum is drawn more and more out of the abdomen, and gradually drags with it those viscera, to which it is so firmly connected. Thus the cæcum and colon are drawn in to form part of the hernial sac: when we open the latter, and turn aside its loose contents, we see the large intestine lying in the back of the sac, as it lay in the ileo-lumbar region, connected behind by loose cellular substance to the groin and scrotum, and fixed at the sides by the lateral attachments of the peritoneum. In an analogous manner the fundus of the bladder may be drawn out through the ring. (See the chapter on Hernia of the Bladder.)

On the other hand, when the fixed part of the large intestine has descended originally, protrusion of some loose viscera may be added to it, and occupy the bag formed between the surface of the gut and the hernial sac.

We can hardly set bounds to the extent of the displacement in these cases. I lately examined an immense oscheoceles, which had nearly reached the knees; the cæcum had descended to its very bottom, and the ascending colon was seen fixed to the back of the sac, as it ordinarily is to the posterior and lateral part of the abdomen. The enormous sac contained the whole omentum, jejunum, ileum, and arch of the colon.

The course of the protrusion is the same as in the common inguinal hernia; that is, the parts descend through the inguinal canal, over the spermatic vessels, and between them and the cremaster muscle. The peritoneal sac, therefore, is covered by the tunica vaginalis communis of the

cord, and by the fibres of the cremaster, as in the case of the ordinary bubonocoele; and the spermatic vessels are in immediate contact with the intestine behind.

It will be obvious, from the preceding account, that these descents must take place gradually; that the displacement of parts connected, as the cæcum and colon are, in their natural situation, must be a slow process; and consequently, that herniæ formed suddenly by any accidental cause or violent exertion cannot be of this kind. Further, as the parts which descend are bulky, a large opening is required to transmit them: hence such ruptures will probably occur when the aponeurotic parietes of the abdomen in the inguinal region are naturally weak, or where the openings have already been enlarged by previous protrusion: hence too they are little likely to become strangulated.

On account of the connexions already particularised, which confine the protruded parts in their unnatural situation, these herniæ must be irreducible under ordinary circumstances, and in reference to a more or less considerable portion of their contents. When some of the loose viscera have passed into the sac, they may be replaced; and the looser part of the cæcum or sigmoid flexure may be pushed up, leaving the more fixed portion behind. If the return of the latter can be accomplished, it must be under the steady and long-continued employment of the means pointed out in the chapter on irreducible herniæ. M. CLOQUET considers that such measures would generally be successful. "I am convinced," he says, "that few cæcal herniæ would be found really irreducible, if the patient were confined to bed for a long time, and constant pressure, more considerable in degree than the propelling force arising from the action of the respiratory muscles, were maintained by means of a concave and elastic pad." As an interesting example of what may be thus effected, I relate the following case:—

"An old man was brought into the Hôtel Dieu in 1811, on account of a voluminous and irreducible scrotal hernia of the right side: he was placed in the ward St. Joseph, which was then under my charge. The tumour was equal in size to the head of an infant three months old: it was tense in the erect and soft in the recumbent position; but the contents could not be returned into the abdomen. The coverings were thin, so that the sacculated form of the

cæcum and the convolutions of the small intestine could be distinguished. The testicle adhered closely to the back of the tumour, as well as the spermatic cord, which was flattened and varicous. Occasional irregularities occurred in the performance of the intestinal functions. The swelling was inclosed in a suspensory bandage, which fitted exactly, and kept up a gentle but constant pressure. The patient lay on his back, with the pelvis a little raised by means of a pillow, so as to make the abdomen perfectly horizontal. At the end of fifteen days there was a visible diminution: a fresh and smaller suspensory was applied every third day. The reduction was complete in a month, when a truss with a large pad was put on, and the patient left the hospital.”*

In the rare event of strangulation occurring in one of these ruptures, and requiring an operation, the conduct of the surgeon will be regulated by the same principles as in large and adherent herniæ; (see CHAPTER XI. SECTION 8.)

If the nature of the protrusion had not been previously recognised, and the ordinary operation had been performed, the state of the case would become apparent on opening the sac. The stricture should be divided, the intestine left in its situation, and the integuments brought carefully together over it.

If an operation should be performed when the intestine has no peritoneal covering, or if the incision should be made over an uncovered part of the bowel, when the sac is very small, the surgeon would be completely puzzled unless he bore in mind the possibility of these occurrences. When the nature of the case is ascertained, the only good that surgery can effect is to relieve the intestine from the pressure of the stricture.

SECTION VII.—SEVERAL HERNIÆ EXISTING TOGETHER.

Internal and external inguinal hernia may co-exist on the same side; and these two may occur in conjunction with femoral hernia of the same side.

Cases are recorded, in which a common inguinal and a

* *Ibid.* p. 111-12, note.

congenital hernia have existed together on the same side. The complication is probably very rare. Mr. WILMER mentions an instance in which the operation was performed, and a portion of intestine replaced from the tunica vaginalis. The symptoms of strangulation continuing, the man died : and another sac, containing a mortified portion of intestine, was found in the same ring.*

Persons not unfrequently have two or more ruptures : the proportion of such cases, and the particular combinations, will appear from the report of patients relieved by the City of London Truss Society ; see note CHAP. I. SECT. 2. In a patient, examined by Sir A. COOPER,† who had laboured under complaints, accompanied with difficulty in voiding the water, three protrusions had taken place in each inguinal region, and all of them on the inside of the epigastric artery. In another person, who had three ruptures, with symptoms of strangulation, there was embarrassment in the treatment of the case.‡

* *Pract. Obs. on Hernia*, p. 104. Besides ARNAUD, who had witnessed such occurrences, (*Mem. de Chirurg.* tom. ii. p. 603,) the following references are made by SCARPA, who had not seen it himself; SANDIFORT; BRUGNONE, *Diss. de Test. Posit.* § xlv; RICHTER, *Chirurg. Biblioth.* tom. vii. p. 591.

† *On Inguinal and Congenital Hernia*, pl. x.

‡ *Ibid.* p. 27.

CHAPTER X.

SYMPTOMS AND DIAGNOSIS OF INGUINAL RUPTURES.

THIS complaint is much more frequent in the male than in the female sex. Its occurrence, indeed, in the latter, is comparatively rare ; while it has been calculated that more than two-thirds of all the ruptured males have this kind of descent. The greater dimensions of the ring in the male subject account satisfactorily for this difference.

It is observed more frequently on the right than on the left side ; and the difference has been ascribed to the employment of the right arm in cases which require the greatest exertion of strength and activity.* (See page 42.)

SECTION I.—SYMPTOMS OF INGUINAL HERNIA.

Inguinal hernia, or bubonocoele, under which general term we include the *scrotal*, regarding it merely as a modification of the complaint, is a swelling, possessing the characters which have been enumerated in the general description of ruptures, either confined to the groin, or ex-

* “ En fait de hernies inguinales, il y en a un tiers de plus du coté droit que du côté gauche ; sans doute à cause des mouvemens plus violens du bras droit. Il n’en est pas de même des hernies crurales, dont la différence du côté gauche ou droit n’est pas si sensible.” JUVILLE, *Tr. des Bandages Herniaires*, p. 22.

Of one hundred and forty-two ruptured persons in the Hôtel des Invalides, SABATIER found that forty-four had ruptures on both sides ; fifty-five on the right, and forty-three on the left only. *Acad. de Chir.* tom. v. p. 836.

According to RICHTER and SABATIER, inguinal epiplocele is most frequent on the left side, in consequence of the omentum hanging lower on that side. *Traité des Hernies*, p. 200 ; *Médecine Opératoire*, tom. i. p. 135.

tending thence to various distances in the scrotum. It passes into the ring, and is thus distinguished from most of the many other tumours which may occur in this situation. Coming out of the abdomen through the same aperture which gives passage to the spermatic cord, it is first perceived in the groin, and it then descends gradually in front of the cord. The latter part can generally be traced along the back of the swelling, especially in its early period, when of moderate size, and confined to the groin. We recognise it by taking the swelling between the finger and thumb, and pressing the parts gently backwards and forwards: the firm round vas deferens is particularly distinguishable. In large old scrotal ruptures, the cord is flattened and incorporated with the swelling; its component parts are separated, and we can no longer discover its situation. Nor shall we find it in the usual place under the varieties in its course, and in the mutual relation of its parts described in CHAP. IX. SECT. 2. In the inguinal form of the complaint, the testicle is below the swelling, and we trace the cord between them. It is below or behind the scrotal rupture, and more or less closely connected to the tumour. Sometimes the testicle is placed laterally, towards the outside; and, occasionally, it is situated in front of the swelling at its lower part, where I have seen it, in a few instances, forming a conspicuous prominence.

Inguinal hernia presents itself to our observation under very various circumstances, which must be attended to in considering the diagnostic characters of the affection. It may be *external* or *internal*, *complete* or *incomplete*; it may pass into the bend of the thigh, instead of descending into the scrotum; it may contain intestine, omentum, or both, with or without the presence of fluid; the contained omentum may have its natural structure, or it may be enlarged or hardened; it may be reducible, easily or with difficulty, irreducible, obstructed, or strangulated; it may exist alone, or in conjunction with disease of the cord, testicle, or other neighbouring parts; it may be found where the testicle has not descended, or in connexion with various irregularities in the position of that organ.

Complete external or oblique inguinal hernia.—This is generally formed slowly. The parts first distend the inguinal canal, causing a fulness just above the anterior part of the crural arch. The patient experiences a sense of weakness, and sometimes complains of pain in this situation.

When he coughs, or sneezes, this feeling is increased, and we observe an unusual impulse and prominence in the situation of the inguinal canal. When the effort ceases, the parts resume their normal appearance. The peritoneum may be protruded at this time, so as to form a process resembling in shape and size the end of the finger of a glove; or it may yield to the effort, and resume its natural position when the muscular action ceases. Sooner or later, a small swelling appears at the lower opening of the inguinal canal; this increases into a more or less considerable tumour, generally approaching to the oval form, but sometimes rounded. In the progress of the complaint, the protruded parts descend gradually into the scrotum, when we find the rupture under considerable varieties of form and outline, larger below, and gradually tapering towards the ring.

In an external inguinal hernia of recent formation, the swelling begins nearly midway between the anterior superior spine of the ilium and the symphysis pubis; it goes obliquely downwards, and forwards, and this more slender portion or neck expands, below the external abdominal ring into the body of the rupture. The neck lies immediately on the pubes, between the two columns of the external ring.

That portion of the swelling, which is connected to the abdominal parietes, has an oblique direction from below upwards and outwards. This, which may be called the neck, is generally smaller than the rest of the swelling, and corresponds in length to the distance between the upper and lower openings of the inguinal canal. It is longest in herniæ of recent origin, being an inch and a half in length in the adult; it becomes gradually shorter and shorter, as the pressure of the protruded viscera brings the upper nearer to the lower opening, until, in old ruptures, the obliquity of the neck is lost altogether. Hence external inguinal herniæ have been divided into those with long, and those with short necks.*

External inguinal hernia seated in the bend of the thigh.—A modification of external inguinal hernia is sometimes observed, in which the parts, instead of descending into the scrotum or labium pudendi, turn downwards and outwards into the bend of the thigh, and thus occupy

* F. K. HESSELBACH, *Disquisit. anat. de ortu et progressu herniarum*, p. 54.

the same position as in femoral hernia. Mr. A. BURNS communicated such a case to Dr. MONRO.* The tumour occupied the bend of the thigh in an old emaciated female. "The herniary sac was about two inches in length, and in shape resembled a Florence flask; the bulbous extremity, extending from the lower orifice of the canal, was contained in the upper part of the thigh, lying more in the course of a crural than of inguinal hernia. By dissection we ascertained that the deviation from the usual direction of the tumour was produced by a premature separation from each other of the external pillars of the inguinal canal."

Mr. KEY met with this variety of inguinal hernia in the male subject. "The shape of the swelling was peculiar: the hernia, instead of passing downward into the scrotum, turned, after emerging from the inguinal canal, over the tendon of the external oblique muscle and appeared somewhat like a femoral hernia. The testicle had never descended lower than the external ring, and explained the peculiarity in the course of the hernia."†

Mr. A. BURNS had seen this modification of inguinal hernia in the female, in other cases, which he considered as belonging to the congenital species. He says, "I have examined seven cases of this kind, (*i. e.* congenital in the female,) and in six I have found the anterior side of the inguinal canal deficient." "In one of the subjects with congenital hernia, the sac did not escape from the canal; in five, it had, from the peculiar state of the canal, descended along the thigh, assuming to a great degree the resemblance to crural hernia." "In congenital inguinal hernia the risk is, that we mistake the disease for crural hernia. It has been seen, that the tumour in the former, owing to the imperfect state of the anterior wall of the canal, comes, in the majority of cases, by separating the fibres of the oblique aponeurosis, to place itself, in so far as regards the course of the swelling, in the situation of a crural hernia." Dr. MONRO adds, "there are many examples within my knowledge, where this mistake was never discovered till after the operation had been performed." He also observes, that the tumour lies above the adipo-glandular fascia, and is consequently more superficial and defined than in the crural hernia.‡

* *Morbid Anatomy of the Human Gullet*, p. 467.

† *Memoir on the advantages of dividing the stricture*, &c. p. 25.

‡ MONRO, *ibid.*, p. 514—516.

Incomplete external inguinal hernia.—The case assumes a very different appearance, when the rupture is incomplete, being still contained in the inguinal canal. The protrusion, which is generally small, is covered by the aponeurosis of the obliquus externus, in addition to the integument, and to the stratum of adipous membrane, which is often thick in this region. Hence the margin is undefined, and the case is altogether obscure. There is a fulness, arising from distension of the inguinal canal, rather than a tumour: it is situated just above the crural arch, and externally to the lower opening of the inguinal canal. Mr. MACILWAIN says, “in none of the examples which have fallen under my observation, has there been any external tumour; although, occasionally, slight fulness over the inguinal canal has been observed.”* Frequently, the existence of the complaint is unknown to the patient, and is ascertained with difficulty even by the surgeon.

These circumstances should induce us to examine the groin attentively where the symptoms lead to the suspicion of a hernia, and not to be contented with the statement given by the patient. Sir A. COOPER † mentions an instance, in which a woman, with all the symptoms of inflammation of the bowels, frequent vomiting and constipation, denied the existence of any swelling at the groin or navel: yet a small inguinal rupture was discovered after death. I have seen a small portion of intestine strangulated at the upper opening of the inguinal canal, though the patient did not know that he had a rupture; and the surgeon, who had examined the inguinal region carefully, had not been able to detect it.

The following case, related by Mr. MACILWAIN, shows the conduct which the surgeon ought to pursue under doubtful circumstances. “My attention was requested to a woman, thirty-three years of age, whom I found labouring under symptoms of strangulated hernia. As these were unequivocal, I examined the abdomen with great attention, particularly the inguinal and femoral openings. No hernial or other tumour was discoverable. On making pressure along the inguinal canal on the left side, she complained of great tenderness, which was confined to this situation. On inquiry, I found that she had been ruptured, and that some years before, she had received a truss from

* *Surgical observations*, p. 257.

† Part i. p. 56.

the society, the use of which she had long discontinued. As it was obviously interesting to know for what description of hernia she had been relieved, I immediately consulted the books of the Truss Society, and found her case recorded as a left inguinal. No doubt now remained in my mind as to the nature of the case, and I accordingly treated it as strangulated hernia, intending to operate should the measures prove unsuccessful. The same evening we were so fortunate as to procure evacuations; her symptoms immediately disappeared, and no tenderness existed in the course of the inguinal canal.”*

This rupture is sometimes of larger size; the swelling, prevented from passing the tendon of the external oblique, extends between the aponeurosis of that muscle and the surface of the internal oblique, and may reach even to the anterior superior spine of the ilium. Instances of this kind are mentioned in CHAPTER IX. SECTION 3.

Internal or direct inguinal hernia.—As the viscera in this case come directly through the abdominal parietes, and protrude at once through the ring of the obliquus externus, this form of the complaint is rarely, if ever, *incomplete*. It appears first in the groin, and then descends, in the course of the spermatic cord, into the scrotum.

The swelling, placed immediately over the upper and anterior surface of the pubes, between the columns of the external ring, has a rounded form, so that the appearance in a recent case is such as would be produced if the half of a ball were placed with the cut surface over the ring. Traced from below, it passes directly upwards into the abdomen over the pubes. The neck, corresponding to the direct thickness of the abdominal parietes, which is here considerable, is very short, and has no obliquity.

The spermatic cord is on the outer side of the rupture at its passage through the ring; the tumour descends over the cord, which, however, still remains rather towards its outer side. The testicle is below: it has been represented that, if the rupture should reach the bottom of the scrotum, the testicle will be found towards the outer side or anterior aspect of the fundus of the sac. I have met with no case in the dead subject, in which this kind of rupture has passed so low down.

The rounded form of the swelling, at its commencement,

* Lib. cit. p. 256.

together with its short neck and straight course, contrasts strikingly with the elongated shape and obliquity of the recent external bubonocoele. Although the neck of the sac becomes nearly straight in an old external inguinal hernia, it is always found rather further from the linea alba and the root of the penis in that, than in the internal. The appearances of the swelling, however, will not always enable the surgeon to distinguish the internal or direct from the more ordinary external or oblique form of the complaint, more especially as the neck of the former, in the increase of the tumour, spreads outwardly. Such distinction is not important for practical purposes; since, in a doubtful case, we should follow the same course whether the bubonocoele were external or internal.

It is rightly observed by Sir A. COOPER, that direct inguinal herniæ do not increase to that size, which the more common cases frequently attain: he had never seen it of more than moderate magnitude. All the instances which I have observed have been comparatively small. A. K. HESSELBACH states, that this rupture, although much less common in men than the external, is met with more frequently in women; so that, in a doubtful case, we may conclude that it is internal in the latter, external in the former.*

Inguinal hernia of the female.—In this sex there is generally a large quantity of fat under the integuments in the region occupied by bubonocoele, rendering it difficult to ascertain the true characters of the swelling, which is often small, and seldom exceeds a moderate size. Hence careful examination is necessary in such cases.

In the beginning, when it is contained in the inguinal canal, it causes a fulness in the anterior part of the inguinal region. Having passed the ring of the obliquus externus, it constitutes a swelling, which, although sometimes concealed by the surrounding adipous texture, is readily ascertained by the touch. In its further increase, it descends into the labium pudendi, where it seldom acquires considerable magnitude, the position and size of the part being less favourable to the increase of the protrusion, than the male scrotum. Mr. MACILWAIN met with one as large as a small cocoa-nut, and took a cast of it. He operated on another, of nearly the same size, which had become strangulated.†

* Lehre, p. 143.

† *Surgical observations*, 1830, p. 254.

The largest inguinal hernia in the female, that I have found recorded, was one examined by Mr. CLEMENT.* It occurred in a hard-working woman, fifty-two years of age, and had not prevented her from following her laborious avocations. She was seized with pain in the bowels on returning home from work in the evening; this increased in severity, and vomiting came on. A tobacco-clyster was administered, after which she was found in great pain, with low and fluttering pulse, anxious countenance, and great exhaustion. As she was passing from her bed to the operating table, the circulation began to fail; coldness of the extremities, and syncope came on; and she died in eighteen hours from the first symptoms of strangulation. The rupture measured, in length, seventeen inches, in circumference, at its broadest part, twenty seven inches and a half: it extended more than two thirds down the thigh, and completely concealed every part of the pubes and the external organs of generation. The rupture contained colon, distended with hard feces and pressing on the lower contents, consisting of jejunum and ilium, black and gangrenous; and a quart of serous fluid.

It should seem that the modification of external inguinal hernia, in which the columns of the aponeurosis of the obliquus externus continue separated higher up than usual, and the swelling consequently descends into the bend of the thigh, is more common in females than in males, as Mr. BURNS had seen five instances of it in the former. See *ante*, p. 242.

As the external inguinal hernia of the female, arising at the upper opening of the inguinal canal, traverses that passage, and descends into the labium, the swelling has an oval or elongated figure, and a marked obliquity of position. It has been justly observed by Sir A. COOPER,† that the obliquity of the neck does not become effaced as in the male; that the resistance of the external abdominal ring causes the swelling to increase in the canal before it appears in the groin, and thus ultimately the tumour has a slight division into two parts, an upper and outer contained in the canal, a lower and inner in the upper part of the labium pudendi; these two parts are separated by the tendon of the obliquus externus.

* *Observations on Surgery and Pathology*, p. 135.

† Pt. i. p. 71, edit. 2.

Sir A. COOPER * says, that he has not met with internal inguinal hernia in the female. I have seen it only once, in a female subject brought into the anatomical theatre of ST. BARTHOLOMEW'S Hospital for dissection: it was discovered and pointed out to me by Mr. HAFFENDEN, a very intelligent and industrious student, who now practises at Hanwell. Another case is mentioned by F. K. HESSELBACH;† it was attended with a most unusual course of the epigastric artery, which, arising from the crural by a trunk common to it with the obturator, passed behind the neck of the sac, and then along the inner side of its mouth.

Assuming the infrequency of internal inguinal hernia in the female, we might find a reason for it in the comparatively small dimensions of the external abdominal ring. There seems, however, some doubt respecting the fact. A. K. HESSELBACH says, "Internal inguinal hernia is altogether less frequent than the external, and it is less common in the male than in the female sex. Hence, in doubtful cases, we may conclude, in the female, that the rupture is internal, in the male, that it is external, especially if it be on the right side, because external bubonocoele occurs more frequently on this than on the left side, in consequence of the process of the tunica vaginalis remaining open towards the abdomen more frequently on this side."

SECTION II.—DIAGNOSIS.

The circumstances, under which inguinal herniæ are presented to our notice, are very various, and there is corresponding variety in the diseases, with which they may be confounded. In order to establish the distinction, without which serious mistakes in treatment will be inevitable, it is necessary in many cases to examine attentively the origin, progress, local characters, and symptoms of the complaint.

A reducible intestinal hernia in the groin is a soft some-

* *The anatomy, &c. of abdominal hernia*, edit. 2, pt. i. p. 73.

† *Disq. anat. de ortu et progressu herniarum*, p. 15.

‡ *Die Lehre von den Eingeweide-brüchen*, p. 143.

what elastic tumour, continued into the inguinal canal, of variable size and figure ; free from pain ; disappearing on pressure, and giving way spontaneously in the recumbent position, coming down again in the erect position, or when the respiratory muscles are exerted ; and communicating an impulse to the hand when the patient coughs, sneezes, or otherwise puts the muscles of the trunk in strong action.

Mr. MACILWAIN rightly observes, that a chronic abscess presenting at the abdominal ring is almost the only affection that could be mistaken for such a hernia. The previous history, and the sensible characters of the swelling, would probably point out the true nature of the affection. I never saw a case of the kind ; but Mr. M. relates one. He saw a female, whom he found in bed, complaining of pain in the abdomen, with slight tenderness on pressure at the abdominal ring. The bowels were constipated. " Examination of the part discovered a small tumour, having very much the characters of inguinal hernia. As the tumour readily receded on pressure, and as nothing could then be felt on the introduction of the finger within the ring, she was merely ordered to keep quiet, and to take some aperient medicine. In about a week, the bowels having been regularly evacuated, the tenderness at the ring increased, and the skin, which had been hitherto of its natural colour, became tinged with the blush of inflammation ; this gradually increased for a few days, when the tumour burst, and discharged a considerable quantity of healthy-looking pus. She now gradually recovered, although some weeks elapsed before the discharge had entirely ceased." *

Hydrocele of the tunica vaginalis in a child, where the communication with the abdomen remains open, is another case that might be mistaken for reducible intestinal hernia. The contents of the swelling go up on pressure, and there is an impulse on coughing. The fluctuation, which is very obvious, the thinness of the coverings, the transparency of the tumour, and its perfect uniformity of surface, with the absence of the gurgling sound, which characterises the return of intestine, point out the true nature of the affection.

A testicle, which has not descended further than the

* *Surgical observations*, p. 253.

groin, remaining at the external aperture of the inguinal canal, or a little below it, may sometimes be pushed back partially or entirely into the ring, and it soon descends again when the pressure is removed. Here we have a swelling in the groin that admits of replacement like a hernia. The size, form, and consistence of the swelling, which experiences no impulse on coughing, the peculiar sensation excited by pressure, the connexion with the tumour of the spermatic cord, if that cord can be felt, and the absence of the testis from the scrotum, will prevent us from mistaking this for a rupture either intestinal or omental. We may find more difficulty in determining the true nature of the case, when an imperfect descent of the testicle is combined, as it frequently is, with a rupture. The latter is congenital. The appearances and symptoms may be still further complicated by the presence in the tunica vaginalis of fluid, which passes into the abdomen on pressure, and descends again.

A reducible inguinal or scrotal epiplocele constitutes a soft, doughy, inelastic tumour, in which we can sometimes feel inequalities of surface or consistence, with an impulse on coughing ; disappearing spontaneously, or on pressure, in the recumbent position, and soon slipping slowly out again in the erect attitude. Varicocele and hydrocele of the cord are the two cases most nearly resembling it.

Varicocele occurs almost invariably on the left side.

The sensation which the enlarged, distended, and convoluted veins of the spermatic cord, in their varicous state, impart to the fingers of the examiner, is so characteristic, that a person, who has once felt it, can hardly mistake varicocele for hernia. In the former case, the largest part of the swelling is below, the basis resting on the testicle ; the tumour terminates short of the ring, or is much diminished before reaching the opening, which is of its natural size. The enlargement occupies the cord itself, which, on the other hand, can be felt behind the tumour in an omental hernia.

The foregoing remarks apply more particularly to the characters of the affection in its recent state. The most experienced surgeons have confessed the difficulty of distinguishing, in some cases, between an omental rupture and a varicous affection of the spermatic veins. A large and old varicocele is soft and doughy to the feel, and, like an omental hernia, may extend into the ring itself, which may

be enlarged from this cause. An epiplocele, when taken between the finger and thumb, may present inequalities, with a somewhat stringy feel. The swelling of varicocele increases, with slight impulse, when the patient coughs, holds his breath, or remains long in the erect position; and is lessened in the recumbent posture, or even in some degree by pressure. Attention to the following circumstances will enable us to distinguish between the two complaints in doubtful cases. Varicocele begins below, at the upper and back part of the testicle, on which it rests, and rises towards the ring in proportion as it grows larger. The commencement and progress of an epiplocele are just the reverse of these. Varicocele enlarges and diminishes very gradually under the circumstances just pointed out, and we cannot ascertain, by applying the fingers to the ring, that anything passes into or out of the abdomen. When a piece of omentum is pushed back into the belly, and comes out again, we can feel unequivocally that something ascends and descends. When the omentum has been returned, a healthy cord remains behind; while the veins are still felt morbidly enlarged after the diminution of the varicous swelling by pressure or position.

In an old varicocele the size of the testis is often diminished.

Sir A. COOPER recommends the following mode of distinguishing the two complaints in case of doubt. Let the patient be placed in the recumbent position, and have the swelling reduced. The surgeon presses on the ring with his finger, and allows him to rise. The pressure is sufficient to prevent any of the viscera from descending, but not to stop the passage of blood through the spermatic artery. If the tumour should re-appear while this pressure is kept up, the case is varicocele. In applying this test, the surgeon must take care to cover the whole of the ring, so as to preclude completely the descent of omentum.

In *diffused hydrocele of the spermatic cord*, called by Mr. POTT, who has given the best description of it, *hydrocele of the cells of the tunica communis*, fluid is effused into the cellular texture which incloses and connects the component parts of the cord, within the investment formed by the tunica vaginalis communis and the cremaster. From its confinement by the parts just mentioned, the swelling derives an uniformity of surface, and a definite figure, which is at first cylindrical or oblong, and subsequently

rather broader below than above. It terminates below at the testicle, which is sound and distinct from the swelling, the boundary between them being marked by a depression externally. It extends into the ring, and may produce sensible enlargement of the cord within and beyond the inguinal canal. The appearance and symptoms have been well described by Mr. POTT, who details the circumstances of three cases, in two of which he examined the affected parts after death.* The disease has also been described by SCARPA, who had met with opportunities of examining it by dissection, and has illustrated its nature and appearance by several engraved figures.† “In general,” says Mr. POTT, “while it is of moderate size, the state of it is as follows. The scrotal bag is free from all appearance of disease; except that when the skin is not corrugated it seems rather fuller, and hangs rather lower on that side than on the other, and if suspended lightly on the palm of the hand, feels heavier: the testicle with its epididymis, is to be felt perfectly distinct below this fulness, neither enlarged, nor in any manner altered from its natural state: the spermatic process is considerably larger than it ought to be, and feels like a varix, or like an omental hernia, according to the different size of the tumour: it has a pyramidal kind of form, broader at the bottom than at the top; by gentle and continued pressure it seems gradually to recede or go up, but drops down again immediately on removing the pressure; and that as freely in a supine as in an erect posture: it is attended with a very small degree of pain or uneasiness; which uneasiness is not felt in the scrotum, where the tumefaction is, but in the loins.

“If the extravasation be confined to what is called the spermatic process, the opening in the tendon of the abdominal muscle is not at all dilated, and the process passing through it may be very distinctly felt; but if the cellular membrane which invests the spermatic vessels within the abdomen be affected, the tendinous aperture is enlarged, and the increased size of the distended membrane passing through it produces to the touch a sensation not very unlike that of an omental rupture.”

In reference to this point of diagnosis, SCARPA observes that “the diffused hydrocele of the cord, when it

* *Chirurgical Works*; vol. ii. p. 252—257. CASES VIII. IX. X.

† *Memoria sull'Idrocele del cordone spermatico*; in *opuscoli di chirurgia*; vol. i. tab. 5 and 6.

enters into the ring, resembles an omental hernia so closely that it is very difficult to distinguish the two complaints. Both have a cylindrical form and extend into the ring. They are similar in consistence and degree of sensibility, as well as in the difficulty experienced in returning them. POTT represents that the omentum, when returned, remains in the abdomen until the patient assumes the erect position, or makes some effort; while the swelling in diffused hydrocele comes back immediately. I have found, however, that the omentum comes down again quickly in some omental herniæ, and that the swelling, when pushed up, does not re-appear immediately in some cases of diffused hydrocele. I have observed that the swelling is firmer and more irregular on the surface in the epiplocele than in the watery effusion; and that the latter is larger below than above, while these proportions are reversed in the rupture.”*

The cells containing the serous effusion are small above and become larger as we descend: they sometimes end at the lower part in a single cavity, containing a considerable quantity of fluid.† This circumstance must give to diffused hydrocele, at its lower part, a character of fluctuation, which is not met with in omental hernia, unless in the rare case of fluid being effused into the sac.

The distinction of the two cases must rest on the following points. The impulse on coughing in the rupture; the complete removal of the swelling, and the sense of the omentum passing up into the abdomen; its visible and tangible escape from the cavity when the rupture is brought down again by coughing; and the free natural condition of the cord and ring when the swelling has been replaced. The fluctuation of the watery tumour at its lower part; the absence of impulse in coughing; its imperfect removal under pressure, so that the cord can never be felt in a natural state; and sometimes a visible enlargement of the inguinal canal, and its neighbourhood, when the fluid is pressed upwards.

Encysted hydrocele of the cord is characterised by the

* *Sull'ernie*; Mem. i. § xxxii.

† In one case operated on by SCARPA, three ounces of serum came out when the base of the swelling was punctured; *Osservazione* i. p. 158; in another, some ounces were discharged; *Oss.* v, p. 163. In one of Mr. POTT's cases, where the disease had attained an enormous and unusual magnitude, more than a quart of clear limpid water burst forth at the first puncture, and eleven pints were subsequently discharged by moderate and continued pressure. Case x. p. 270.

defined form of the swelling, which does not extend to the ring, by its manifest fluctuation and partial transparency, by the uniform size of the tumour, which experiences neither enlargement nor diminution, by its freedom from impulse, by its complete indolence, and the absence of all the symptoms attendant on ruptures.

I lately saw a watery cyst as large as a walnut in the spermatic cord of a youth under twenty. By continued pressure in the horizontal position the contents could be slowly squeezed out, leaving the bag quite collapsed. The swelling would then slowly return. As the complaint caused no inconvenience, there was no necessity for operation.

A diffused hydrocele of the cord might be mistaken for an irreducible epiplocele, or for one admitting of partial reduction.

The spermatic cord may contain depositions of fat, as well as effusions of watery fluid, and these often resemble omental herniæ. We sometimes see a small mass near the ring, in the dead body; and, in consequence of the looseness of the surrounding tissue, it may pass back into the ring, and come down again. Usually, these adipous depositions do not admit of such return. They had been observed by MORGAGNI, and are noticed by PELLETAN* under the name of "*Hernie graisseuse*." He saw a case where the mass was equal in size to four fingers, and this was accompanied by a small empty peritoneal protrusion: a similar fact is recorded by M. J. CLOQUET.† In the instances, which have occurred to my notice, the peritoneum has not been affected. These accumulations of fat have the soft feel and lobulated character of ordinary fatty tumours, produce no inconvenience, indeed no symptom but swelling, and consequently they do not require any surgical treatment. If such a tumour should be present in a patient labouring under constipation and other symptoms resembling those of strangulated hernia, it might lead to the performance of an unnecessary operation, as in the instance recorded by M. MACILWAIN; "a

* *Clinique chirurgicale*; tom. iii, p. 33.

† *Recherches sur les causes et l'anatomie*, &c., p. 26, note.

Sir A. COOPER has given figures of two small lobulated growths of fat, one of which was seated in the spermatic cord near the ring; the other was connected with the external abdominal ring in the female. Pt. i. edit. 2, pl. xiii, fig. 2 and 3.

patient had a tumour in the course of the spermatic cord, attended by symptoms of strangulated hernia. The tumour was very properly cut down to, and no intestine discovered, but a piece of substance having the characters of fat. This the surgeon proceeded to remove; but finding it to be so intimately connected with the cord, as not to admit of extirpation without injury to the latter, he removed tumour, testicle, and all.* If, in such a case as this, after carefully examining the position, connexions, and state of the swelling, and considering its history, we should think that it possibly might be a rupture, and the cause of the symptoms, it would be right to ascertain the point by cutting down upon and into the part. The further measure of castration would not be justifiable except for reasons, which do not appear in the preceding short narrative. The origin, the early state and symptoms of the swelling, would point out its nature in the case of irreducible epiplocele.

Diagnosis of scrotal hernia.—This rupture resembles hydrocele, and some other affections of the testis, to a certain extent, in the form and position of the tumour, which is usually somewhat pyriform, larger below, and smaller above. When the disease has arrived at this state, its origin and progress, together with the other concomitant circumstances, characterise it so strongly, that the patient generally understands the nature of the affection, about which there can hardly be any doubt if the hernia be reducible; the distinction is not so easy when it has become irreducible. The most frequent error in diagnosis, however, consists in mistaking diseases of the cord or testis for ruptures; hence arises the practical mistake of directing the application of trusses when they are unnecessary and hurtful.

When we see a swelling of the scrotum, generally pyriform, uniform on the surface, which commenced below and gradually ascended; if we cannot feel the testicle, being merely able to judge of its position by the greater solidity of the swelling at one part, and by the peculiar uneasiness experienced when this part is pressed, while we can distinguish the spermatic cord, of its natural size and in a healthy state, above the tumour; if we can feel fluctuation, and discover partial transparency when a

* *Surgical Observations*; p. 291, note.

lighted candle is held near one side of the enlargement, we are confident that the disease is an effusion of fluid into the cavity of the tunica vaginalis testis. We conclude that the complaint is a rupture, when the swelling began at the ring, and has gradually descended; when the spermatic cord can be obscurely traced along its posterior surface, or cannot be felt, while the testicle is readily distinguished below the tumour, or at its outer part: and when the symptoms belonging to ruptures in general are present at the same time.

A hydrocele sometimes extends along the cord in its whole length, and reaches to the ring; and the swelling is sometimes so tense, especially when it is thus extended, that fluctuation can hardly be distinguished. The origin of the tumour below, and its gradual ascent; its not being subject to variation in size, and the impossibility of distinguishing the testicle, show that the case is hydrocele. The uniform surface of the swelling, and the partial passage of light through it, when a candle is held close, are further proofs of the same point. The employment of the candle affords useful assistance in some doubtful cases: I resort to it frequently, not only in such instances, but in order to confirm conclusions formed on other grounds, and sometimes for the purpose of determining the exact position and size of the testicle in hydrocele.

The tunica vaginalis may become so extended when hydrocele is left to itself, that the swelling not only ascends along the cord, but actually passes the ring, and enters the inguinal canal, being at the same time usually tense. As a portion of the tumour is covered by the aponeurosis of the obliquus externus, a slight impulse is experienced on coughing. When we find that the swelling began below, and has ascended, that it possesses fluctuation and partial transparency, and that the cord and testicle cannot be distinguished, we shall have no difficulty in determining that it is hydrocele.

In a congenital rupture the testis cannot be distinguished, as it is included in the same bag with the viscera. The continuation of the swelling into the ring, the variations in the size of the tumour according to the position of the body and other circumstances, its origin from above, and the impulse occasioned by coughing, will point out the existence of a protrusion: if the swelling has commenced below, and does not vary in size, and if no impulse is felt

on coughing, it is a hydrocele. Inguinal hernia may exist in conjunction with some other affection; and scrotal hernia may be combined with any disease of the cord or testis; these combinations sometimes rendering the diagnosis more difficult. The rupture will be attended with its characteristic signs; and, if the parts can be returned, the nature of the other disorder will be more easily determined. The history of the case will probably assist in elucidating the subject.

SCARPA mentions a case of scrotal hernia, which he saw in a student of medicine, where the fundus of the swelling was pushed forward in such a manner as he had never seen before by something situated behind. It was not the testicle, which could be felt of the natural size below the swelling. The operation was performed. When the intestine had been returned, the sac was pushed forwards at its lower part by a soft tumour obviously containing fluid: an opening was made in this, and serum escaped. A vesicular glutinous substance was seen in the aperture, seized with the forceps, and removed by a few strokes of the scissors. It was an encysted hydrocele of the cord.*

Scrotal hernia is combined not unfrequently with hydrocele, each disease being marked by its peculiar symptoms. A close examination may be necessary in order to detect the true nature of the case.

The hydrocele and the rupture may form two distinct swellings, an upper and a lower one, or they may meet together; the distinction being marked externally by a constriction; or they may be completely blended into one swelling, without any distinction recognisable externally.

In the latter case, their relative situations might be expected to depend on the order of their occurrence. If the rupture should have taken place after the formation of the hydrocele, we might expect the former to descend in front of the latter. On the contrary, if fluid should be effused into the tunica vaginalis of a ruptured patient, the swelling would probably rise in front of the rupture. Mr. STANLEY met with two instances, in which hydrocele was placed directly before scrotal hernia, and the component parts of the spermatic cord were separated by the tumour, which seemed to have been forced between them. These specimens, with three others, are preserved in the museum

* *Sull' ernie*; Mem. ii. § 44.

of ST. BARTHOLOMEW'S Hospital. In all five the hydrocele is in front of the rupture; and in most of them it ascends nearly to the ring. The same relative position of the two diseases has been observed by others: and may therefore be considered as the ordinary arrangement (see p. 265). In a case of similar complication, M. CLOQUET found the rounded fundus of a small hernial sac situated behind, and adhering strongly to the upper part of the hydrocele; the vessels of the cord were partially separated. He considers that hydrocele and other swellings of the testicle may constitute a predisposing cause of ruptures, by dragging down the spermatic cord, and with it the depression of the peritoneum, which marks the exit of those vessels. The co-existence of the complaints is hardly frequent enough to justify this view.

Combinations are possible, in which it would be difficult to form a satisfactory diagnosis. For instance, the presence of fluid in a rupture together with the protruded viscera. If the hernia were congenital, so that the testis could not be felt, the case might appear very obscure. Under such circumstances, if it were necessary to try some mode of relief, on account of the size of the swelling, or other concomitant inconveniences, a puncture might be cautiously made with a small trochar, a grooved needle, or the point of a lancet. A case of congenital epiplocele, in which the omentum had become adherent, so as to close the mouth of the sac, and fluid had accumulated below, quoted from Mr. POTT, is mentioned in the chapter on irreducible ruptures, at p. 132.

The same excellent surgeon has recorded another somewhat similar example. A young man, twenty-two years old, had been subject to a rupture as long as he could remember; for a month or two it had been constantly down; but it had never descended below the groin. For three days symptoms of strangulation had existed. There was a large swelling in the scrotum, with the characters of hydrocele: but the swelling extended into the ring, where it was hard, painful, and girt by the tendon of the abdominal muscle. Mr. POTT divided the integuments as in the operation for hernia, and then, opening the sac, let out half a pint of clear limpid fluid. The testicle was situated in the back of the cavity. On passing the finger upwards, a portion of intestine was found, tightly constricted. It could not be returned, after dividing the stricture, until

an adhesion which was then discovered, had been separated.*

Since the round ligament of the uterus is not liable to those disorders which attack the spermatic cord and testis, the diagnosis of inguinal hernia, when it occurs in the female, is not so obscure and difficult as in the male.

It may be mistaken for crural hernia, as I shall explain in the chapter on that subject.

Serous cysts containing fluid of watery consistence are sometimes found in the groin of females, and may extend into the labium. Some suppose that they arise from the distention and enlargement of the process of serous membrane connected with the round ligament, and named, after its discoverer, the *canal of NUCK*.

DESAULT saw, in a girl of twelve years, a soft indolent swelling, with some transparency, as large as a hen's egg, seated in the right groin and labium. It contained two or three ounces of limpid serum.†

LALLEMANT, having an opportunity of examining such a case after death in a female thirty years of age, found the disease to be a watery cyst formed in the cellular texture enveloping the round ligament.‡

In an example, recorded by SCARPA, the disease, which had existed fifteen years, and was operated on at the age of thirty-four, formed a pyriform tumour in the left labium, fourteen inches in circumference, but not thicker than the thumb at its pedicle. It was elastic, compressible, and uniform on the surface; and it exhibited transparency when examined with a candle. It was extirpated. The cyst was easily separable from the distended integuments: the contained serum amounted to forty-three ounces.§

* *Works* ; vol. ii. p. 419.

† *Journal de chirurgie* ; tom. i. p. 251.

‡ *Mémoires de la Société d'Emulation* ; tom. iii. p. 321.

§ *Opuscoli* ; tom. i. p. 152.

CHAPTER XI.

OPERATION FOR STRANGULATED INGUINAL HERNIA.

THE operation for bubonocoele, as indeed for any other species of rupture, consists of the following parts: incision of the integuments; dissecting down to the sac, and opening it; removing the stricture; and replacing the protruded viscera. The following account applies particularly to the first species of inguinal hernia; and the points of difference in the other kinds will be noticed subsequently.

The instruments necessary for this operation are a double-edged scalpel and common scalpel; dissecting forceps; probe, silver director, and short curved steel director with deep groove; a probe-pointed curved bistoury fixed in its handle, and Sir A. COOPER'S curved hernia knife. The latter, which in size, curvature, and breadth, resembles the ordinary crooked bistoury, is blunt, not only at the end but for the next three-eighths of an inch; it then has a cutting edge of about three quarters of an inch, and is blunt along the remainder of its concavity.* If to these we add curved needles armed with ligatures, adhesive plaster, lint, spermaceti or other mild cerate, linen for compresses, a long bandage, and two pieces of soft sponge, we shall be provided with all that can be required in any cases. It is not to be understood that this apparatus is indispensable; a surgeon might, on an emergency, operate with the instruments contained in his pocket-case.

* A representation of this knife, with diagrams exhibiting the mode in which Sir ASTLEY employs it, will be found in his work, Part i. Edit. 2, pl. xi.

SECTION I.—EXPOSING AND OPENING THE HERNIAL SAC.

The patient should be placed in bed, in the recumbent position, with the trunk horizontal, and the thighs a little bent on the pelvis: the legs may hang over the foot of the bed. He should lie on the right side of the bed, for the more convenient access of the surgeon. He might lie across the bed, or at the foot, with the lower extremities over the side or the end, and supported on a chair. The position must often be determined by the size of the bed, and of the apartment, and the direction of the light, rather than by any general rules. In attempting to return the protruded parts, the thigh of the affected side should be still further bent, and gently turned inwards. The hair must be shaved from the tumour and surrounding skin. The operator, being seated or standing by the side of the patient, or between the lower extremities, makes the external incision, which should begin an inch above the external angle of the ring, and extend over the middle of the tumour, to its lower part, if the rupture be small, or of moderate size: in large tumours, it will be sufficient to divide the skin of the upper third, half, or two-thirds. By beginning the incision above the ring he gains room where it is much needed in a subsequent part of the operation; *viz.* the division of the stricture: and for the same reason he should cut through the cellular and adipous substance in this situation, so as to expose fairly the aponeurosis of the obliquus externus. This cut may be either performed by a stroke of the knife, or by pinching up the integuments, and dividing the fold with a double-edged scalpel. In the latter case the incision may require to be enlarged in both directions. When the skin can be conveniently raised into a fold of sufficient depth, I prefer the method of dividing it by pushing a scalpel through the basis of the fold and then cutting outwards, as being the safest, and most expeditious. In executing this incision, or in the subsequent dissection down to the sac, the external pudic* branch of the femoral artery may be divided, and afford a

* The origin and course of this vessel may be seen in CAMPER's 13th plate.

sufficient hemorrhage to induce us to secure it before we proceed.

The cellular substance intervening between the skin and hernial sac, and the external coverings of the latter, should be carefully divided, layer by layer, with the knife and dissecting forceps. The fascia superficialis, the fibres of the cremaster, and the tunica vaginalis communis, are the parts to be divided; we may not perhaps recognise the first of these; and the two latter are sometimes blended into one investment. An operator not well acquainted with the anatomical structure, may conceive that he has opened the sac itself, when he has divided the outer covering only, where that is close and firm. To avoid all risk of cutting through the sac, and wounding the prolapsed parts, each successive layer may be elevated with the forceps, and divided with the knife inclined somewhat towards the horizontal direction: this precaution should be more particularly observed as we approach the sac. It is sufficient to dissect down in this way at one part: the opening in the sac may be made by elevating it with the forceps, and dividing the apex of the elevated portion with the knife held horizontally; or, we may use the finger and thumb, pinching up the membrane between them, and rubbing them together in order to ascertain that none of the protruded parts are included; generally, however, the swelling is too tense to admit of this. The aperture should be enlarged in both directions with the probe-pointed bistoury, guided by the finger or director, until the whole cavity is laid open, or at least as far as the extent of the external incision. The sac generally contains a small, and sometimes a larger quantity of fluid,* the discharge of which shows that the cavity is penetrated. Since this is not always

* On the subject of this fluid, see *ante*, pp. 35 and 36.

In the following instance an unusually large quantity of fluid was contained in the sac of a bubonocoele.

M. VELPEAU received under his care, in the hospital St. Antoine, an old man with a strangulated scrotal rupture. It was twice as large as the head of an adult, tense, brownish, slightly painful, of uniform surface, and obscurely fluctuating. Examination with a candle did not elucidate the nature of the swelling. It had existed fifteen years without becoming larger than the fist, and had often been replaced. When the sac had been cautiously penetrated, a transparent fluid like urine escaped with a forcible jet. The opening was enlarged, and there flowed out more than three litres (about three quarts) of a slightly turbid serous fluid. In the upper part of the swelling there was an entéro-epiplocele, as large as the fist, strangulated, and mortified in several spots. *Nouv. élém. de méd. opérat.* tom. ii. p. 366.

present, the surgeon cannot depend entirely on its appearance, as indicating that the cavity is opened.

In rare instances the sac contains pus; and this pus or the more ordinary serous fluid may have a fecal smell. This subject is adverted to in CHAPTER XII. SECTION 1.

The blood-vessels of the intestine, its smooth, polished, and unadherent surface, distinguish it from the hernial sac, which has not those vessels, which is rather rough and cellular, and which is always connected to the surrounding parts.

The operator must remember that, when the sac is opened, a probe or the finger will pass freely in any direction within its cavity, unless there should be adhesions, which, in general, are only partial. If the division of the exterior investment should lead him to suppose that he has cut into the true hernial sac, he will be undeceived on finding that the director will not enter the cavity.

Many surgeons are accustomed to make use of the probe or director in dissecting down to the peritoneal covering of the rupture: they thrust the blunt end of the instrument into the cellular substance, and divide with the knife what they have thus raised. This practice carries with it an appearance of roughness, and is a less convenient way of accomplishing the intended object, than that which I have described.

The occasional variations in the course of the spermatic vessels and vas deferens should lead us to proceed carefully in exposing the sac, particularly in large bubonocèles, that we may avoid wounding them. The practice of dividing the integuments and hernial sac separately, of dissecting the intervening substance cautiously, and of not extending the incision to the lower portion of the tumour in large ruptures, will protect these vessels from danger. The plan, which has been recommended, of making a small cut in the skin, of opening the cavity of the tumour, and then carrying the incision through the rest of the skin and hernial sac at once, would certainly expose them to considerable risk. Mr. HEY* divided the vas deferens in this manner.

SCARPA advises that the incision of the skin should be made exactly in the middle of the tumour in large herniæ, where we may expect the component parts of the cord to be separated. He also recommends, that the division should not be carried downwards to the bottom of the sac.†

* *Practical Obs.* p. 146.

† *Sull' ernie*; *Mem.* ii. § 2.

SECTION II.—INCISION OF THE STRICTURE.

The contents of the hernia, when thus exposed, may sometimes be returned into the abdomen, without dividing the stricture. We may press the intestine gently; if its contents pass up into the belly, the bowel will follow. While these sheets were in progress through the press, I operated on an entero-epiplocele, strangulated for three days, during which the taxis and other means had been employed diligently but ineffectually. There was a small portion of intestine, not larger than the end of the thumb, behind a more considerable piece of adherent omentum. When the latter was elevated, the intestine yielded to moderate pressure with the finger and returned into the abdomen. We must not employ in such attempts any force capable of injuring the parts. If, as is usually the case, they do not admit of being thus replaced, the finger must be carried gently into the neck of the sac, to ascertain the seat of the stricture.

In the part, which confines the protruded viscera, an incision sufficient to liberate them, and allow of their easy return, must be made with the curved bistoury, guided by the finger of the operator, or carried along a grooved director. The bistoury, with its back resting on the finger, is pushed forwards towards the abdomen, supported by the finger, which protects the viscera. Or, we may introduce the bistoury resting flat on the finger, and turn up the cutting edge, when it has entered the stricture. The latter is frequently so tight as to preclude the employment of the finger as a guide for the bistoury: its place must be supplied by the director, of which the end should be small to facilitate its passage under the edge of the stricture, and the groove deep to protect the viscera from injury by the knife. The ordinary silver director in a pocket-case of instruments is not well suited to the purpose, the extremity being too large, and the groove not deep enough. A curved steel instrument is preferable, the length and curvature being about the same as those of a crooked bistoury; the extremity should be small, well rounded off, the depth increasing gently to the handle, where it should be a quarter of an inch. The handle should be large enough to give a firm hold. The groove should

be deep, and terminate short of the extremity by a quarter of an inch. When the director is employed, care must be taken to keep the protruded parts away from the edge of the knife: they must be protected by the finger of the operator or of an assistant; or the latter may press them back with the handle of a scalpel, while the director and bistoury are used. The finger should be carried as far into the neck of the sac as it can be without violence, and between the protruded parts and the upper margin of the stricture. The end of the director must be introduced fairly under the stricture: if the groove is pressed gently against the latter, the knife may be used without danger.

As the end of the curved knife must be carried within the stricture, where it is out of sight, and close to the protruded viscera, the instrument devised by Sir A. COOPER, in which this part is blunt, is the safest. The incision of the stricture should not exceed what is sufficient to allow the viscera to be replaced with ease. This can usually be accomplished when there is room for the finger to enter the abdomen: a smaller incision often suffices.* If the incision does not give sufficient room, it must be enlarged.

The division of the stricture is sometimes followed by the escape from the abdomen of serous fluid, which is usually clear, straw-coloured, or of a light red tint, and varying in quantity from two or three drams to as

* A French surgeon proposed to dilate, instead of cutting the stricture, in order to avoid the enlargement and weakening of the ring consequent on the incision. He employed, for this purpose, an instrument composed of two blades, united like those of scissars, and forming, when closed, a concavity on one surface, and a smooth convexity on the other. It was introduced into the ring in this state, with the concavity towards the protruded parts; and the blades were then expanded so as to produce a sufficient dilatation; LE BLANC, *Nouvelle Méthode d'operer les Hernies*, &c. 8vo. Paris 1768: and *Refutation de quelques objections*, &c. 1769. The method is also described in his *Operaions de Chirurgie*, tom. ii.

The difficulty and danger of cutting the stricture, and the fear of weakening the parts by incision, were the chief circumstances which led LE BLANC to adopt the plan of dilatation. It has not, I believe, been practised in this country. Indeed, if there were sufficient room to introduce a dilator, the parts could certainly be replaced without dilatation or incision.

Several instruments have been contrived for the purpose either of dividing the ring, or of protecting the viscera: such are the winged director of MERY, with two lateral processes to guard the protruded parts; the scissars of MORAND; the bistouri herniaire of LE DRAN; which, with others, may be seen in the 24th plate of HEISTER'S *Institutiones*. These devices are so decidedly inferior to the blunt-ended bistoury, guided by the finger, or by the curved and deeply grooved director, that they are now nearly forgotten.

many ounces. As it indicates active inflammation of the peritoneum, it must be regarded as an unfavourable sign. However, in each of two cases, which I operated on while this volume was in the press, several ounces of fluid ran out when the stricture was divided. Both patients recovered.

Seat of stricture.—In performing the operation for strangulated hernia, and especially in liberating the protruded parts from the pressure, which causes strangulation, we must bear in mind that the ring of the obliquus externus is not the only, perhaps not even the most frequent seat of the stricture; that the parts may be confined at the upper aperture of the inguinal canal or by the neck of the sac; and that, occasionally the stricture is below the canal, and altogether independent of it. The following statement embodies the result of DUPUYTREN'S experience on this important point.

“The inguinal ring is believed, and ordinarily represented to be the seat of strangulation in inguinal hernia. This is erroneous as a general representation, and may lead to serious consequences. Thus we have seen operators, contented with having enlarged the ring, push back the parts into the abdomen, leaving them still strictured, not by the ring, but by the neck of the sac. M. DUPUYTREN, whose observations have embraced all the varieties of this subject, has found the seat of strangulation, in different instances, in nearly all the parts of hernial tumours. Once he saw stricture caused by an opening situated between the lower part of the sac, and the upper part of a hydrocele of the tunica vaginalis: the hernia was above, the hydrocele below. In two instances he found that strangulation had occurred at an opening of communication between the front of a hernial sac and the back of a hydrocele: the hernia was behind, the hydrocele in front; a relative position, which the two diseases occupy almost invariably when they co-exist. Once he found stricture in a laceration of the sac from external violence: the intestine had passed through the opening into the cellular texture of the scrotum, where it was surrounded by ecchymoses and effused blood. He had frequently met with it in the hernial sac below the ring, formed sometimes by contractions of the sac, sometimes by the orifice of cells, more frequently by cords, folds, or adhesions of the omentum, which are frequently seen in umbilical herniæ.

He had met with stricture at the orifice of the inguinal

ring frequently; but much oftener above this orifice, at the neck of the sac.

When the stricture is formed by the ring of the external oblique, the swelling of the rupture does not extend beyond that point. The inguinal canal is soft, compressible, and indolent; while the ring is distended, tight, and hard. When, on the contrary, the strangulation is at the neck of the hernial sac, the inguinal canal is full, hard, and painful, presenting a firm cylindrical tumour extending from below obliquely upwards and outwards. We can sometimes insinuate the end of the finger between the protruded parts and the ring, the latter is so far from being distended.

Sometimes there is a slight constriction at the ring, and a more considerable one at the neck of the sac. In other but more rare instances, the inguinal canal is constricted in its whole length, and must be laid open from one end to the other.

In certain cases, where the sac, being loosely connected to the surrounding parts, is capable of being partly pushed up into the abdomen, the stricture is found at a greater or less distance beyond the inguinal canal. In other instances, the hernial tumour having been reduced in a mass, the stricture is still further removed.”*

To proceed with safety and confidence in dividing the stricture, it is desirable to expose as clearly as we can the parts which we have to cut. The first incision should therefore begin high enough to allow the external abdominal ring to be laid bare. When this is the seat of stricture, its division is easily accomplished, the part being within sight. The end of the left forefinger is introduced into the neck of the sac, and serves as a guide for the curved bistoury, which is passed under the edge of the tendon either with its back or flat side resting on the finger.

When the stricture is in the superior orifice of the inguinal canal, that is, generally one or two inches from the external incision, the proceeding is somewhat more difficult, and requires greater caution. We follow the same method, as when the tendon of the obliquus externus causes the incarceration. Sir A. COOPER’s hernia knife should be used in this case; and it should be intro-

* *Médecine opératoire*; nouvelle édition; par SANSON et BEGIN, 1824, p, 473—475.

duced with the flat side towards the finger, until the blunt end has passed under the stricture, when it should be turned up so as to bring the cutting edge against the upper part of the circle, and divide it to the required extent.

Stricture by the neck of the sac is hardly distinguishable, in operating, from the preceding case; and there is no difference in the mode of proceeding. The seat of this constriction is sometimes still further in, than the upper opening of the inguinal canal. We can draw the neck of the sac downwards in some cases, and thus facilitate the division, by bringing the constricted portion into view.

If incarceration be caused by the upper opening or the neck of the sac only, there can be no necessity for enlarging the ring of the external oblique muscle, unless it should so confine the finger of the operator, that he either cannot reach the stricture, or cannot manage the knife with safety. This circumstance is not likely to happen, when the incision of the integuments has been begun sufficiently high.

The protruded parts may be strangulated both in the upper and lower openings at the same time, so as to require an incision in both these situations for their complete liberation. Thus the parts may not be set free, although the tendon of the obliquus externus has been divided; and the surgeon should, therefore, in every instance, pass his finger in the course of the inguinal canal to ascertain whether any stricture still exists at the upper opening or the neck of the sac.

Direction of the incision.—The proximity of the epigastric artery to the mouth of the sac renders the direction of the incision a matter of considerable importance; while the various opinions concerning the course of the vessel have led to a corresponding difference in the directions for executing this part of the operation. The practitioners of this country have generally followed the advice of SHARP* and POTT,† who direct the knife to be carried upwards and outwards, *i. e.* towards the spine of the ilium; and there is no danger of injuring the vessel by cutting in this direction, in the external, which constitute the greatest number of inguinal ruptures. But it would be endangered in the internal, where the hernia descends on the inner

* *Critical Inquiry*, p. 29.

† *Works*, vol. ii. p. 106.

side of the artery; although even here the vessel is situated at such a distance from the external angle of the ring, that the return of the parts can seldom require so large an incision as to expose it to danger.

That an incision directed towards the spine of the ilium does not necessarily divide the epigastric artery, when this vessel takes its course along the outer side of the neck of the sac, is satisfactorily proved by a case, which I have related in a subsequent part of this chapter. We may, indeed, conclude, that the artery has often escaped under these circumstances, when we consider that it has been the general practice to cut the tendon upwards and outwards, and yet that a wound of the vessel seems to have been a rare occurrence. Mr. POTT must have performed the operation for the strangulated bubonocoele a vast number of times; yet no instance of a division of the artery is recorded in his works; nor did he, as I have been informed by a gentleman who heard them, mention any such case in his lectures.

Those surgeons, who have erroneously supposed that the artery has the same relation to the abdominal ring in the diseased as in the natural state of parts, direct the incision to be made in a course precisely opposite to that above mentioned. RICHTER* and BERTRANDI† carry the knife upwards and inwards, or towards the umbilicus: their advice might be followed in internal inguinal herniæ, where the artery is on the outside of the rupture; but this mode of proceeding would be highly dangerous in the more common case, where it runs along the inner margin of the mouth of the sac. The danger increases in proportion as the incision approaches to a course directly inwards; and the vessel must inevitably be cut if the knife were guided horizontally towards the linea alba.

CHOPART and DESAULT‡ vary the direction of the incision according to the actual variation in the position of the artery: thus, they divide the tendon upwards and outwards, when the spermatic cord is behind, or on the inside of the sac; upwards and inwards, when it is before, or on the outside of the hernia. The artery could never be exposed to the slightest risk, if, in pursuance of this rule, the direction of the incision were varied according to the differences in the course of the vessel. We cannot, how-

* *Traité des Hernies*, p. 123.

† *Traité des Operations*, p. 29.

‡ *Traité des Maladies Chirurgicales*, tom. ii. p. 263.

ever, in most instances, ascertain the nature of the case sufficiently for this purpose: the distinguishing marks of the two kinds of rupture are not clear enough to enable practitioners in general to decide upon the point. A common case of scrotal hernia, in which the upper opening, from the duration of the complaint, has been brought opposite to the lower one, cannot be distinguished by external examination from that species, in which the viscera protrude directly from the abdomen. The spermatic cord cannot be felt, and if it could, its position could not be relied on as an indication of the course of the hernia. Although it will hold good, as a general observation, that the spermatic cord passes behind the hernial sac in the common species of inguinal rupture, and on the outer side of it, in the less frequent kind, it does not invariably follow these directions. I have seen it directly behind the sac in a case of the latter description; and the varieties in its course, enumerated in SECT. 2 of CHAP. IX. prove satisfactorily, that we cannot regulate our mode of executing this part of the operation by the position of the spermatic cord.

In case of doubt, ROUGEMONT* directs us to divide the ring upwards, that is, in a course parallel to the linea alba, as the artery can never be endangered by cutting in that direction. PETIT divided the stricture directly upwards in bubonocèle. Having placed the edge of his instrument against the upper angle of the wound, he says, “Je le pousse en dedans, en appuyant le tranchant vers le haut.”† SCARPA’S anatomical knowledge led him to find out, that the right direction for the incision of the ring was upwards, parallel to the linea alba. “J’ai opéré d’après la méthode, que je conseille, plusieurs cadavres qui avoient des hernies inguinales, soit externes, soit internes, en dirigeant mon incision le long d’un fil, qui, partant de la partie supérieure de l’anneau, étoit tendu parallèlement à la ligne blanche: chez tous, j’ai constamment laissé l’artère épigastrique intacte, lors même que je prolongeois l’incision d’environ un pouce au-dessus de l’anneau inguinal.”‡ Sir

* “Je crois d’après cela, qu’il est permis de croire qu’on court moins de risque de léser l’artère épigastrique en incisant en haut et en dehors, qu’en incisant en haut et en dedans; que pour reconnoître exactement la disposition de cette artère, il faut s’assurer de la position du cordon spermatique relativement au sac: et supposé que cela soit impossible, il faut inciser au milieu du bord supérieur de l’anneau.”—Note to RICHTER, p. 125.

† *Traité des Mal. Chirurg.*, tom. ii. p. 367.

‡ *Mem.* ii. sect. v.

A. COOPER adopts the same practice, and follows it in all cases; considering rightly that a multiplicity of directions, adapted to various circumstances, might confuse those who are imperfectly acquainted with the structure and relative position of the parts; and that it is desirable, on this account, to lay down a general rule, which may be followed without danger, in every instance of inguinal rupture.

The precise point, at which the incision of the tendon should be made, is the middle of the superior margin of the ring; the artery can never be situated at this part, nor be exposed to danger, unless the incision be extended to an unreasonable length.

When the stricture is in the superior orifice of the ring, the epigastric artery is invariably found on the inner margin of the aperture, and cannot therefore be injured by carrying the incision towards the spine of the ilium; nor does the practice of cutting directly upwards expose it to any risk. The position of the artery in relation to the mouth of the sac is the same in incomplete external inguinal hernia; while in the incomplete internal form of the complaint, which is extremely rare,* the vessel is found on the outer side of the mouth of the sac. No danger can arise from cutting straight upwards in any case.

SECTION III.—WOUNDS OF THE EPIGASTRIC ARTERY, AND OTHER CASES OF HEMORRHAGE.

Surgical writers have generally stated, that a division of this vessel would be attended with fatal hemorrhage; and the size of its trunk, together with its immediate origin from so large an artery as the external iliac, render the assertion probable. Yet there are hardly any cases recorded, in which actual examination has proved a wound of this vessel to be the cause of death.† GUNZ ‡ says that

* I know no other examples than the two cases quoted in CHAPTER IX.; see *ante*. p. 228.

† I mean in hernia.—Dr. CARMICHAEL SMITH enumerates ten cases, in which death ensued from hemorrhage in consequence of the epigastric artery, or some branch of it, being wounded in the operation of tapping. *Medical Communications*, vol. ii.

‡ *Obs. Anatomico-Chirurg. de Herniis*. “Quod etsi non invenio ab ullo observationum auctore commemoratum fuisse, tamen quando Parisiis eram,

he heard of two instances in Paris, in which the artery had been divided. BERTRANDI,* RICHTER† and LE BLANC‡ assert in general terms, that fatal hemorrhage has ensued several times from division of the epigastric artery; and the former writer says, that he has opened the bodies of men who have died a few hours after the operation, and seen the abdomen full of blood effused from this vessel. Sir A. COOPER§ gives us an instance in which a person died of hemorrhage from the epigastric artery ten hours after the operation; and another, in which the patient recovered after having been extremely reduced by repeated bleedings from the same vessel. In one of Mr. HEY's|| cases there was considerable bleeding, but it was stopped by the use of sponge. SCARPA witnessed a wound of the epigastric artery, in an operation performed by an able surgeon, and the expressions which he employs lead us to suppose that it was fatal.¶

The following case presents an example of the epigastric artery being completely divided, without occasioning any hemorrhage during the operation, or previously to the patient's death. In the subsequent instance it seems certain that this vessel must have been cut, but the fact was not ascertained.

CASE I.—A man about fifty years of age had been subject for many years to a rupture, which could be returned without difficulty. Constipation took place on the 24th of January, 1806, and, as it could not be removed, he was brought to ST. BARTHOLOMEW'S hospital on the 30th of the same month. His belly was distended, but not painful; and a slight degree of sickness was present. About half way between the ring and scrotum he had a soft and somewhat elastic tumour of the size of a pigeon's egg, which bore pressure without causing pain. The ring of the external oblique was perfectly free from tension; there was no testicle on that side of the scrotum. Strong cathartics and tobacco-clysters having failed in procuring any relief, the operation was performed on the seventh day from the

duo exempla herniis affectorum accepi, qui ex vulnere hujus arteriæ vitam amiserunt."

* *Traité des Operations*, p. 29.

† *Traité des Hernies*, p. 125.

‡ *Precis d'Operations*, tom. ii. p. 129.

§ Page 53.

|| Page 159.

¶ *Sull' ernie*; ed. 2, p. 41. "I have had the misfortune to be an eyewitness of this severe and irreparable accident supervening upon an operation performed in a dexterous manner and with the greatest facility." *English Translation* by Mr. WISHART, p. 129.

strangulation. The tumour consisted of a hernial sac full of fluid; when this had been laid open up to the external oblique, the operator discovered that a piece of intestine was strangulated in the internal aperture. He could just reach this with his finger; but he was obliged to divide the lower ring extensively, before he could remove the stricture of the upper opening: this was at last effected, and the intestine returned. No blood was shed during the operation. Mild and stronger purgatives and clysters were all equally ineffectual in removing the constipation, and the patient died on the following evening. The tendon of the external oblique muscle had been cut upwards and outwards for two inches: it had also been divided upwards and inwards for a space of three quarters of an inch. The latter incision, which had included the inferior margin of the obliquus internus and transversus, had completely divided the epigastric artery, at three-quarters of an inch from its origin. It did not appear that the smallest quantity of blood had escaped from the divided vessel. Within the abdomen, and just behind the ring, there was a small piece of intestine perfectly black and gangrenous, which had been strangulated by a preternatural band of adhesion, extending from the peritoneum, close to the ring, to the mesentery. The convolutions of the small intestine, exceedingly distended, (to two and three inches diameter,) seemed to fill the whole abdomen. They were slightly agglutinated to each other, and marked here and there with red streaks. The lower extremity of the testis lay just in the upper opening of the ring.

CASE II.—In the operation for femoral hernia the stricture was divided upwards and outwards. As the first incision did not gain sufficient room for the return of the intestine, the cut was extended in the same direction. The wound immediately filled with arterial blood, which rose again almost directly to the edges of the incision, when removed with the sponge. The mouth of the vessel could not be distinguished; while we were deliberating on the propriety of passing a needle in such a direction as would be likely to include the artery, the patient, who had lost about a pint of blood, fainted, and the bleeding ceased; nor did it come on again. This woman recovered completely.

PROFESSOR VELPEAU found in the body of a person, who had died from the consequences of a penetrating wound of

the abdomen, a complete division of the epigastric artery, the bleeding from which had been inconsiderable, and had ceased spontaneously.*

The risk of hemorrhage in these operations is by no means so great as many writers have represented. On this point my experience and opinion coincide with those of Dr. BRESCHET: "I have heard it observed by great practitioners, by professors LALLEMANT and RICHERAND, both at the head of large hospitals, that the fear of bleeding in the operation for hernia had been much exaggerated. I have seen Professor DUPUYTREN perform a great number of these operations, and have never witnessed any unfavourable consequences resulting from the operation itself."†

In addition to these circumstances I may state, that the occurrence of hemorrhage, even to a considerable amount, after the operation, is by no means a certain proof that the epigastric artery has been wounded; and that large bleeding may occur, where examination after death does not detect a wound of any considerable vessel. These assertions will be justified by the following case.

CASE.—The operation for bubonocoele was performed on a man, at ST. BARTHOLOMEW'S Hospital, October 18, 1806, the tenth day after strangulation. The intestine was generally adherent to the neck of the sac, and its return required but a small division of the ring, which was made upwards and outwards. No blood was shed during the operation; hemorrhage, however, took place on the same evening, but yielded to the application of cold cloths. Symptoms of inflammation occurred on the following evening, and were not subdued till the end of four days; in which time the patient lost ninety-six ounces of blood from the arm, and had twelve leeches applied to the abdomen. On the morning of the eighth day a profuse hemorrhage took place from the wound; it consisted of arterial blood, and did not cease till two pints at least had been lost. He survived this occurrence about a week, during part of which time well-grounded hopes of his recovery were entertained. The most violent and general inflammation was found to have taken place over all the small intestines. They were throughout of a florid red colour, and coagulable lymph had been deposited in con-

* *Nouv. élém. de méd. opérat.* tom. ii. p. 471.

† *Considérations sur la Hernie Femorale*, &c. CONCOURS, p. 129.

siderable quantity on the surface. The parts forming the rupture had been protruded on the inner side of the epigastric artery, which, with its accompanying veins, was at least three quarters of an inch from the point to which the incision of the ring had extended, and, of course, had not received any injury. The spermatic cord passed on the outer side of the hernial sac, but had not been wounded. The arterial branch,* which the epigastric sends to the spermatic cord, had been cut; but its size did not seem adequate to the supply of so profuse a bleeding.†

The conduct which a surgeon should pursue, in case he had divided the epigastric artery, would probably be influenced by the circumstances of the case in which the accident happened. If the extent of the hemorrhage induced an opinion that this artery had been cut, the operator should dilate the wound, expose the orifice of the bleeding vessel, and secure it by ligature. The chance of stopping the hemorrhage will be much increased, if his knowledge of the anatomy of the parts be accurate.

The epigastric artery was divided and tied in a case operated on by Dr. MACKAY of the navy, assisted by Mr. GIRAUD of Feversham, who communicated the particulars to Sir A. COOPER. It was a case of inguinal hernia, with the parts constricted at the upper opening of the inguinal canal. The division of the stricture was followed by copious arterial hemorrhage, and the operator, having felt the jet of blood with his finger, was enabled by separating the parts, which had been freely divided in the operation, to expose the bleeding vessel and tie both its orifices. The patient recovered.‡

SECTION IV.—DIVISION OF THE STRICTURE ON THE OUTSIDE OF THE SAC.

Since the operation for strangulated hernia terminates fatally in a considerable proportion of instances, thus pre-

* It was the artery called by TIEDEMANN *spermatica externa*; the *cremasteric* of Sir A. COOPER; see *ante*, p. 204.

† In a case of scrotal hernia, related by Sir EVERARD HOME, a hemorrhage to the amount of a pint occurred on the tenth day after the operation. *Transactions of a Society, &c.* vol. ii. p. 109. And profuse bleeding came on after the operation in an instance recorded in DUNCAN'S *Commentaries*, vol. i. p. 413.

‡ Part i., 2nd Ed. p. 41.

senting a striking contrast to the complete and safe relief which the patient experiences when the rupture is returned by the taxis; and since the unfavourable result, in the former instance, is apparently referable in many cases to inflammation of the abdomen or intestines, induced by the wound of the peritoneum, or by the exposure, handling, and bruising of the viscera, it has been proposed to operate in such a way as to avoid these sources of risk; that is, to divide the stricture and leave the sac unopened.

JEAN LOUIS PETIT was the first to propose and execute this operation: he has described the mode of proceeding, explained shortly but clearly the reasons for adopting it, and answered satisfactorily objections which had been made to his proposal. In the first edition of his work on the Operations of Surgery, published in 1719, GARENGEOT mentions a case of crural hernia operated on by PETIT without opening the sac, in the preceding year. The latter surgeon recommends the method in those cases to which it is certainly most applicable, namely, large and adherent herniæ. But he also advises its more general employment; excepting those cases only, in which mortification has occurred, in which the parts have become adherent, or the intestines contain either hardened feces or foreign substances. “*Mon sentiment est donc qu’excepté les hernies gangréneuses, celles qui sont maronnées, quelques unes de celles, dans lesquelles l’intestin contient des corps étrangers, toutes les autres peuvent être traitées ainsi; il y en a même qu’on ne doit point traiter autrement.*” He goes on to say, “Let us ask ourselves the question, of what use it is to open the sac? The only purposes, that I know of, are to expose the intestine and omentum in order to remedy morbid changes, if there should be any, to separate these parts if they should have become adherent, and to be able to handle the intestine and push back hardened feces or foreign substances. Now I except these cases; in all others, which are far more numerous, why open the sac? There is no indication for such a proceeding; while, on the other hand, the obvious advantages of omitting it are, that we avoid exposing the protruded parts to the air, and escape the risk of wounding them: moreover, I shall show that, in respect to the consequences of the operation, it is desirable that the sac should not have been opened. From these several considerations I conclude that it is

better to enlarge the ring on the outside than from the inside of the sac.”*

MAUCHART† HEISTER,‡ SHARP,§ and others, have spoken of PETIT’s proposal, and condemned it, apparently without having ever submitted it to the test of experience. RAVATON brings it forward as an entirely new proceeding, in his *Treatise on Gunshot Wounds*, 1750; and assures us, that he had employed it in three cases with complete success ||

The method of PETIT met with a zealous advocate in the second Dr. MONRO,¶ who insists strongly on the unfavourable results of the ordinary operation for strangulated hernia, ascribing them entirely to the exposure of the parts to the air. He relates four cases in which he adopted the plan. He represents that PETIT did not understand the principles on which its utility depends, and particularly that he did not know the mischievous effects produced by the contact of air with the contents of a circumscribed cavity. We cannot but feel surprised at this accusation, when we see that the French surgeon recommends his method chiefly because it avoids exposure of the hernial contents to the atmosphere.** I do not mention this from attaching any importance to the opinions respecting the dangerous properties of the air, but as an act of justice to PETIT, and in order to clear the memory of one, who has deserved so well of surgery, from the imputa-

* *Traité des maladies chirurgicales, et des opérations qui leur conviennent; ouvrage, posthume de J. L. PETIT; nouvelle édition, 1790. Tom. ii. p. 331.*

This posthumous work was not published until 1774: its author, who died in 1750, says, that he had operated on herniæ in this way more than thirty years before. “Il y a plus de trente ans que j’ai mis cette méthode en pratique pour la première fois et elle m’a réussi.” *Ibid.* p. 329.

The observations of PETIT on this matter will be found in the three following sections of CHAP. vii. vol. ii., viz. § ix. *De la manière d’opérer les Hernies sans ouvrir le sac.* § x. *Des raisons que j’ai de conserver le sac herniaire, et d’éviter, s’il se peut, de l’ouvrir.* § xii. *De l’opération qu’on fait aux grosses hernies.*

† *Diss. de hernia incarcerata;* Tubing. 1722. In HALLER’S *disp. chir.*

‡ *Institutiones chirurgicæ.*

§ *Critical Inquiry.*

|| *Traité des plaies d’armes à feu;* Paris, 1750. “Nouvelle façon d’opérer la bubonocèle.” p. 305 et seq.

¶ *Description of all the bursæ mucosæ of the human body, &c.* Fol. 1788. Also in the “*Essay on crural hernia,*” of his son, Dr. MONRO tertius.

The date of MONRO’S first operation is 1770.

** “Il est même très avantageux d’éviter cette operation (opening the sac,) parce qu’on n’expose point les parties à l’air.” p. 373.

tion of practising and advising what he did not understand.* His sentiments on this subject will not be found inferior, either in argument or style, to those of the more modern author.

Sir ASTLEY COOPER recommends the operation of PETIT in large and old ruptures, and details cases in which he had performed it: he thinks that surgeons will employ it more generally when they shall have learned its advantages from experience.

As the operation, although recommended by the high authorities just quoted, has been but little practised, probably because its execution is attended with some difficulty, Mr. KEY directed the attention of the profession to it in a clinical lecture published in 1829;† and has since minutely examined the subject in a *Memoir on the advantages and practicability of dividing the stricture in strangulated hernia on the outside of the sac*; 8vo., 1833. He strongly advises it as a general mode of operating in strangulated ruptures. That the number of deaths from the operation would be considerably diminished by the adoption of a plan for liberating the incarcerated parts without wounding the abdomen, cannot admit of doubt. All those would be saved, in whom the fatal event is caused by peritonitis or enteritis excited by the operation.

The fatal inflammation may, however, owe its origin to the injury, which the prolapsed parts, especially intestine, have undergone from the pressure of the stricture, or from mechanical violence in attempts at reduction. Sometimes the intestine thus injured does not recover when replaced; we find it, on examination after death, discoloured and dark, with its coats softened, the peritoneal covering easily peeling off, or disorganised and gangrenous. In such cases it is a morbid centre, from which inflammation spreads over the abdomen. Again, the peritonitis found after death may be merely a continuance of inflammation begun and developed previously to the operation. The deaths which

* Dr. MONRO supports his assertion concerning PETIT's ignorance of the true principles, on which the utility of his operation is founded, by a quotation which the reader must immediately perceive to have no connexion with the subject; and he will accordingly find that the passage in question is taken from a section of PETIT's work, in which he is speaking on a point altogether different. It must be regretted that a misrepresentation of this nature should not have been corrected in the republication of Dr. MONRO's remarks in his son's *Essay on Crural Hernia*.

† *London Medical Gazette*, v. 4, p. 193.

are referable to the two latter heads cannot be ascribed to the operation.

These remarks are illustrated by a fatal case of strangulated femoral hernia, in which Mr. BRANSBY COOPER operated without opening the sac. The peritoneal inflammation, which had already begun, went on unchecked by the operation, affording a proof that the peritonitis, of which evidences are so commonly met with after the operation for strangulated hernia, does not always depend on the wound inflicted on the membrane. This case also suggests a doubt, whether, when the rupture contains omentum, inflamed to a certain extent, it would not be safer to open it and remove the diseased part, than to return the latter into the abdomen, and leave the sac unopened. A female, aged forty-eight, with a femoral hernia, had the symptoms of strangulation, namely, constipation, constant nausea, and pain in the abdomen, on December 17. She lost thirty ounces of blood on the 20th, and was operated on in the evening of the 21st. Having exposed and opened the fascia propria, Mr. B. COOPER introduced a director under the stricture, and divided it with a hernia knife, when the contents passed easily into the abdomen, leaving the sac empty. The bowels were not relieved; the symptoms continued and increased, and death ensued in thirty-seven hours. Examination after death disclosed inflammation and dull red colour of the peritoneum, with sero-purulent effusion. There was a peculiar and offensive odour not stercoraceous. A dirty brown chocolate-coloured fluid bathed the parts in the immediate vicinity of the sac. "A portion of the omentum, nearly three inches square, appeared to have been compressed in the hernial sac: it was of a dull brown colour, intermixed with green, and its veins were turgid with dark blood. A portion of small intestine, lying about three inches from the mouth of the sac, was, to a small extent, greatly contracted, as if tied by a thread. On more minutely examining this part, it appeared that about an inch of intestine was folded upon itself towards the mesentery, so that the peritoneal coat was folded together. On opening the intestine, a dusky red line about an eighth of an inch broad, was found passing nearly or quite round the intestine, at the part where this contraction and fold existed: ulceration had nearly or quite taken place at this part: it was obviously the result of mechanical injury; and it can scarcely be doubted that the intestine at this part

had been strangulated at the mouth of the sac. For a space somewhat larger than a crown piece around the mouth of the sac, the parietes were of a dusky brown colour, and irregular spots, having the appearance of sphacellus, were seen beneath the peritoneum, which was unbroken over them.”*

We have not at present sufficient data for determining the relative proportions of deaths ascribable to each of the three causes just mentioned. Mr. KEY† has detailed the principal circumstances of thirteen fatal cases taken in succession.

Two of these (No. I. and VI.) were not operated on: in a third (No. X.) death occurred in thirteen hours after the operation, the bowels not having been relieved. No satisfactory examination of the body was made. Mortification of the intestine was found after death in four cases: (II. V. IX. and XII.) In two of these (II. and XII.) the bowel had mortified previously to the operation; in a third (V.) the protruded small intestine, between two and three feet in length, could not be replaced; it was therefore opened and left in the wound. In the fourth (IX.) “the strangulated portion was marked at the point of stricture by a gangrenous line,” so that the fatal mischief to the bowel was not caused by the operation. In one (III.) the intestine was in so bad a state, that it was left in the wound; in another (VII.) it could not be replaced. In one (VIII.) death took place in twenty-nine hours, apparently from the intestine not having recovered; it was found dark, and the serous membrane easily peeled off. In one (XI.) operated on after the parts had been returned, death ensued the same day; the intestine was found dark and injured. Death seems to have been owing to peritonitis excited by the operation in two instances only (IV. and XIII.)

Mr. KEY correctly observes, that the peritonitis consequent on operations for hernia, does not originate from the incision of the sac, but that it spreads from the portion of bowel which has been strangulated.‡ He ascribes, however, the unfavourable state of bowel which was found in so large a proportion of his thirteen cases, and which, I believe, will be met with in the majority of those who die after the operation, to the operation itself and its attendant circumstances; namely, exposure to air and light, change of tem-

* GUY'S *Hospital Reports*, vol. I. p. 209.

† *Memoir*, p. 12—26

‡ *Ibid.* p. 12.

perature and handling. I think it rather owing to the pressure of the stricture, which affects the parts, not like the slight violence of the operation, for a few minutes only, but uninterruptedly for hours, and sometimes days, disturbing the circulation, making an impression on the intestine as if it had been tied with a string, and sometimes causing ulceration either of the internal tunics or of the bowel in its whole thickness. That inflammation, excited by this kind of injury may cause death, is clearly proved by Mr. KEY's cases; in the sixth of which the parts had been returned by the taxis, but death ensued in three days from peritonitis; and the bowel was found discoloured and softened. In the eleventh case, the rupture had been replaced before the operation, and the sac was found empty. After death, which took place in a few hours, the intestine was seen dark and dusky; there was also sero-purulent effusion into the cavity.

When we find the intestine at the time of the operation mortified, as in Cases II. and XII., distended and discoloured, so that it could not be replaced and required to be opened, as in Case V., so altered that the operator would not venture to return it, as in Cases III. and VII., the mischief is obviously independent of the operation; and its source is rendered unequivocal when we see the tube marked by the stricture, and mortified at the part thus impressed, as in case ix. Of the thirteen fatal cases recorded by Mr. KEY, the operation had been performed in eleven, in nine of which the morbid condition of the bowel does not seem to me to have been caused by the operation.

Objections have been made to this operation from the danger that might ensue if fetid fluid, bowel already mortified, or likely to become gangrenous, or diseased portions of omentum should be returned into the abdomen. It has been observed in reply, that we should replace the parts by the taxis without scruple or fear, if we could do so; this operation, therefore, merely enables us to effect that return of the hernial contents, which we should have willingly accomplished without it. The answer, although specious, is not quite satisfactory: it proceeds on an assumption, which is obviously incorrect, namely, that the protruded parts are in the same state in ruptures which admit of replacement, and in those, where the closer pressure of the stricture and the longer duration of their confinement prevents their return into the abdomen.

It must, I think, be admitted, that there are dangers in the latter, which do not exist in the former case : their exact amount can only be ascertained by experience ; at present, we cannot consider them as sufficiently serious to constitute an objection to the proceeding.

We may, indeed, in most instances avoid the risk, now alluded to, by carefully inquiring into the history and general symptoms, and attentively examining the tumour both before and during the operation. If the duration of the strangulation, the condition of the pulse, the general state of the patient, the local symptoms, especially a fetid smell when the swelling is laid bare, should lead us to suspect that mortification is approaching or has occurred ; if we should fear that the omentum is seriously inflamed, or if we find it enlarged and indurated, we may proceed to open the sac, or, having replaced the intestine, we may leave the omentum behind.

The next point for inquiry is, whether this method is easily practicable ; whether surgeons in general are sufficiently conversant with the anatomy of hernia to be able to divide the stricture on the outside of the sac. Some difficulty must be expected, when we consider how closely the protruded parts are embraced in many instances, how intimately the sac is connected to the parts through which the tumour descends, and how the cellular tissue becomes consolidated about the neck of the sac by the pressure of trusses. This tissue, however, is generally loose enough to allow the end of a director to be passed on the exterior surface of the peritoneal production under the stricture. Yet skilful anatomists and operators have sometimes failed to accomplish the object. RICHTER* informs us that he once tried to divide the ring without cutting the sac, but found it impracticable. MONRO mentions four cases, in which he attempted the operation ; he was obliged to open the sac in one, a femoral rupture ; it is uncertain whether he did not do the same in another, a congenital bubonocoele. In a case of inguinal hernia, Sir A. COOPER “endeavoured to remove the stricture without opening the neck of the sac ; but ineffectually.”† Mr. KEY was obliged to open the sac in the two first instances in which he attempted the operation.‡ In a large tense scrotal hernia ope-

* *Traité des hernies*, p. 118.

† PART I. p. 40. Ed. 2.

‡ *Memoir* ; pp. 123 and 127. He has recorded a third failure, without mentioning who was the operator ; p. 18. The rupture, in all three cases, was inguinal.

rated on by Mr. LISTON “on the external ring being exposed, it was freely divided by a bistoury, and an attempt was made for a short time to reduce the contents of the sac. The sac was then exposed and laid open.”* The same thing has happened to myself, and to one of my surgical colleagues in two or three cases. Such failures are of no consequence; for, if we cannot divide the tendon without the sac, or if, having divided it, we are prevented from returning the protruded viscera by stricture in the neck of the sac itself, or by any internal obstacle, we may then open the tumour in the usual way; or it may be sufficient to make in the sac, just below the stricture, a small opening capable of admitting the finger; the curved director and knife introduced through this will enable us to divide the stricture.

My colleague, Mr. LLOYD,† has recorded a case, in which he found it necessary to open the sac in consequence of the stricture being formed by its neck. It was a large scrotal hernia of long standing in a patient fifty years of age. The abdomen was much distended and very tender, as also was the hernial tumour; and the symptoms altogether were extremely urgent. Mr. LLOYD began the incision “above the external inguinal ring, which having fairly exposed, with such portion of the tendon of the external oblique muscle, as well as of the hernial sac, as corresponded with the wound in the skin, I freely divided its upper boundary, so as completely to remove all constriction made on the tumour by that part. I then endeavoured to return the hernia, but failed, in consequence of the unyielding condition of the neck of the sac. The sac was of its natural texture except at its neck, where we thought it appeared slightly thickened. Under these circumstances I proceeded at once to open the sac; which having done, it was found that the external stricture had been wholly removed, and that the only impediment to reduction was in the neck of the sac; and here a mere touch, as it were, of the knife, effected all the division that was necessary; the unyielding and constricting part consisting of what appeared to be little more than a thread, or, if I may use the term, a mere ligature of fine tendinous fibre.” The contents of the sac were about two feet of in-

* *London Medical Gazette*; vol. iv. p. 508.

† *On the division of the stricture in strangulated hernia, without opening the sac.* *London Medical Gazette*; vol. xvii. p. 969.

testine, a considerable portion of omentum, and several ounces of serum. The patient survived the operation three weeks; and I entirely agree in the opinion expressed by Mr. LLOYD, that his life would have been preserved, if the parts had been returned without opening the sac.

PETIT'S* method of proceeding was simple. Having dissected down to the sac where it passes out from the ring, he took a flat grooved director curved towards its end, and insinuated it between the ring and the sac. A bistoury carried along the groove divided what was thus raised. If sufficient room was not thus gained, the director was pushed further on, and the bistoury used again. When the protruded parts had been thus relieved from the stricture, they were replaced by gentle pressure.

Mr. KEY employs a director similar to that used by PETIT. "The blade is below the level of the handle, and is slightly curved; the extremity being flattened to enable it to pass with more facility under a firm stricture; the point of a common director might lacerate the peritoneum on account of the pressure required to make it pass under the stricture."†

Mr. KEY recommends in inguinal hernia a mode of proceeding, by which the surgeon may be enabled to divide the stricture either at the external or internal ring. He makes an incision of an inch and a half over the neck of the tumour, so as to lay bare the lower portion of the external oblique tendon, where it forms the ring. A small opening should then be made in the tendon just above the ring: by introducing the director, it will be found whether the stricture is at the lower or upper opening. In the former case, the director is carried under the margin of the tendon, which is then divided to a sufficient extent. If the stricture should be at the upper opening, the incision in the aponeurosis of the obliquus externus must be enlarged, so as to expose the lower margin of the two succeeding muscles with some fibres of the cremaster. The latter may be separated by the end of the director, which should be carried under the edge of the transversus, the instrument being depressed upon the sac, in order to carry its point under the border of the muscle, which may be divided to the required extent.‡

In a case of strangulated scrotal rupture, operated on by

* *Traité des Mal. Chirurg.* tom. ii. p. 329.

† *Memoir* ; p. 134.

‡ *Ibid.* p. 146—148.

Mr. LUKE at the London Hospital, the stricture was divided from without. The patient, twenty-four years of age, was brought to the hospital on the 7th of July, 1831, with a large scrotal rupture, which had appeared for the first time two hours before from an exertion in raising a large plank. The tumour was large, tense, and extremely painful; the countenance anxious: there was pain in the abdomen, with rejection of every thing taken into the stomach. The taxis and the warm-bath having been tried without success, the operation was performed without loss of time. Mr. LUKE made an incision, of about four inches, in the direction of the inguinal canal, and extending to the upper part of the tumour, and then carefully cut down to the neck of the sac, which the tendon of the obliquus externus was distinctly observed tightly girding, so that it was impossible to introduce a director between them; the stricture was therefore divided from without, by means of the point of a scalpel, and then, without opening the sac, the intestines were returned into the abdomen, on which the man expressed himself immediately relieved." Bleeding, leeches, and other means were necessary, and the wound had nearly closed on the 26th of August, when he became unwell; on the following day sickness came on, and the hernia descended. The symptoms of strangulation, which were urgent, could not be removed, and the operation was repeated. It was now necessary to open the sac, which contained eight or ten inches of dark-coloured intestine. The patient died in a fortnight; and it was then found that the rupture had been congenital.*

The plan of removing the stricture without opening the sac is particularly applicable to large and old ruptures, especially if the parts should be adherent, as they frequently are in such cases. To separate the preternatural connexions would require a tedious and difficult dissection, with long exposure and much handling of the viscera; and the violence necessarily inflicted in executing such an attempt renders the subsequent occurrence of inflammation almost certain. In laying open the whole of a large hernial tumour, the exposure of so extensive a surface is a source of great danger to the patient, who in such cases is frequently advanced in years, and therefore less able to withstand extensive inflammation and suppuration. We must remember too, that in large herniæ, which have been

* *London Medical Gazette*; vol. ix. p. 102.

long irreducible, the abdomen becomes accommodated to the diminished bulk of its contents, and that either it will not yield sufficiently to receive again the parts which have been long protruded, so that we cannot replace them, or, if we should accomplish the return, it is so painfully distended, that the replaced viscera are soon forced out again. Moreover, the ring is so much dilated in these cases, that the hernia will certainly re-appear, and consequently there can be no expectation of a radical cure from the operation.

These reflections will induce us to adopt the practice of removing the stricture without opening the tumour in all such cases. The operation will be performed by making an incision of two or three inches in length through the integuments over the abdominal ring. We then dissect down to the fascia, which covers the hernial sac, and make an opening in that fascia. This allows us to pass a grooved director under the tendon; and the probe-pointed bistoury may be conducted, by means of the groove, to the part that requires division. If we cannot accomplish our object in this manner, a small aperture may be made in the sac near the ring, which will enable the surgeon to introduce a curved director under the stricture; the knife carried along the groove divides the tendon with ease. When the parts are thus set free, they should be returned into the belly by pressure on the swelling, if adhesions do not prevent this; at all events they generally admit of being replaced in part. The sides of the incision should be carefully approximated by means of sticking plaster; and they will probably unite by the first intention: an event which could not be very reasonably expected, if the operator followed the advice of a writer, who recommends, that the skin should be *accurately stitched* by means of stitches placed at a finger's breadth from each other.

We thus accomplish the only rational object, which the performance of the operation can be expected to attain; that of rescuing the patient from the dangers attendant on the strangulated state of his rupture: and we accomplish it by a method of which the risk is inconsiderable. The return of all the viscera could be effected only at the great hazard of the patient's life; and would be attended with no corresponding advantage, as their subsequent protrusion, after a longer or shorter interval, might be anticipated with considerable confidence.

PETIT adopted this plan in an old and very large hernia, dividing the ring so as to allow the return of such parts as would go up easily, and leaving the rest in the sac. Such, he says, is the course we ought to follow in similar cases, since the first object is to save life, the cure of the complaint being a matter of secondary importance. To follow out this precept in the case of a patient labouring under such a hernia as we are now considering, we remove the strangulation, because its continuance would destroy life; but we leave the parts in the sac, because their replacement would probably cause death. He represents strongly the difficulty and danger of opening the sac and detaching extensive adhesions, and particularly of returning parts after such a dissection into the abdomen, from which they have been long absent. He says that a large bulk of viscera, which has been long protruded, may, if replaced, affect the abdomen as a kind of foreign body; and he mentions two cases of considerable herniæ returned by the taxis, in which death ensued from inflammation caused by the replacement.*

A case, which illustrates the same points, is related by Sir A. COOPER.† The swelling, which reached half way to the knees, had existed from infancy, and never admitted of complete replacement. The presence of a constant cough rendered it probable, that, if the parts were returned by the operation, they would be forced out again. Sir A. COOPER therefore divided the stricture without opening the sac: this enabled him to return a portion of the prolapsed viscera. The strangulation was completely relieved, and in a few days the person, who was fifty-four years of age, had perfectly recovered. The same gentleman has furnished us with an instance of the fatal effects of a different conduct. Strong and general adhesions rendered the separation and replacement of the parts, contained in a large strangulated ventral rupture, impracticable: inflammation speedily followed the exposure of the tumour, and the patient perished in thirty-seven hours.‡

Mr. DALRYMPLE, of Norwich, opened the sac of an enormous crural hernia, and the patient died in three days. There is every reason to believe that life would have been

* *Traité des mal. chir.* tom. ii. p. 347—351.

† Pt. i. p. 45 and 46.

‡ Pt. i. p. 46.

preserved if the stricture had been removed without dividing the sac.*

The following case affords another proof of the advantages of the proceeding, which I have recommended in these instances. The favourable termination must be entirely ascribed to the discrimination and judgment of my late respected friend, Mr. CROWTHER, surgeon of Bridewell and Bethlem Hospitals, who suggested the mode of operating, and did me the favour of communicating the particulars.

CASE.—The operation for strangulated hernia was required in an old and neglected scrotal rupture, which exceeded in size a quart decanter. Mr. CROWTHER, who had just perused MONRO'S work on the *Bursæ Mucosæ*, immediately perceived that this was a case precisely adapted for the method recommended by that author, and accordingly advised its adoption. On making an incision down to the ring, it appeared, that the contents of the rupture were not pressed on by the tendon of the external oblique. A small opening was therefore made in the sac, in order to ascertain the state of the parts within: no sooner was the cavity penetrated, than a bloody fluid issued from the opening with considerable force; a gurgling noise was heard, and the intestine went up spontaneously. A portion of omentum, which remained behind, was reduced without difficulty, and the wound united by the first intention.

The safety of the operation, and the advantages in promoting the easy and speedy recovery of the patient are strikingly exemplified in a case operated on by Mr. LLOYD. The patient was in his eightieth year, and had a large scrotal hernia, which had been strangulated about twenty hours. The swelling was tense and tender, particularly near the ring; the abdomen was tumid and tense: there was obstinate constipation with stercoraceous vomiting. The pulse was feeble and irregular; the countenance shrunk; the complexion of a leaden hue; the eyes glassy; and the vital powers exceedingly depressed. Mr. LLOYD says, "I commenced the incision of the skin about an inch above the external inguinal ring, and extended it downwards two inches and a-half in front of the tumour. I then carefully dissected down to the tendon of the external oblique muscle, and to the sac, along the whole course of

* COOPER, Part ii. Ed. 2; p. 15, 16.

the wound. Having done this, I passed a slightly curved director under the edge of the ring, which, with a probe-pointed bistoury, I divided directly upwards, as far as seemed necessary to remove the source of strangulation. I then attempted to reduce the hernia, but found that there was still an impediment, which, on examination, proved to arise from the compression occasioned by two fine bands of unyielding fascial, or tendinous-like fibres, about a quarter of an inch from each other, extending across the neck of the sac, and to which they were so closely adherent as to be scarcely distinguishable from the sac itself. I therefore carefully divided them, having previously, and not without some difficulty, insinuated the flat end of the probe underneath them. I then made gentle pressure with both my hands on the tumour, which now, I had the satisfaction to find, readily yielded, the intestinal part of its contents returning with a gurgling sound into the abdomen. The patient was instantly sensible of relief. There still, however, remained some omentum down, which, as I found it was not easily to be returned, I resolved to leave in the sac without further interference. There was also evidently some fluid in the sac." The wound was closed with sutures and adhesive plaster in the usual way. "The patient slept well after the operation; the bowels acted copiously in the night, there was no return of sickness; and in the morning he was able to take nourishment, and appeared almost as well as he could have been if the intestine had been returned without an operation. Not a bad symptom subsequently occurred; and on the third day I was able, with very little difficulty, to return the omentum into the abdomen; after which the parts were easily kept up by a compress and bandage. The wound healed by the first intention, and the fluid in the sac became quickly absorbed, so that on the eighth day all was well except the small ulcers caused by the ligatures. On the eleventh day, every thing was healed, and the patient completely restored to health." *

Advantages of this method in herniæ containing cæcum or the sigmoid flexure of the colon.—As the intestine contained in those herniæ of the cæcum and colon, which are described in CHAPTER IX. SECTION 6, cannot, on account of its firm lateral and posterior connexions, be returned into the ab-

* *London Medical Gazette*, vol. xvii. p. 967.

domen ; and since, even if it were replaced, the renewal of the protrusion might be anticipated with certainty, in consequence of the great size of the ring in these cases, they are particularly well adapted for the modification of the operation which we are now considering. The nature of the case cannot, however, be ascertained beforehand ; until the sac is opened, the kind of protrusion is not recognised. We must be contented, as soon as we have discovered this point, with removing the stricture, and bringing the integuments together over the intestine, which is left in its place.

Division of the stricture on the outside of the neck of the sac in the ordinary operation for bubonocoele.—When a strangulated inguinal hernia is laid open in the usual way, Sir A. COOPER recommends that the sac should not be included in the division of the stricture. If the latter is seated in the external abdominal ring, he says, “ It is best to divide the stricture by passing the knife between the ring and the sac, as a larger portion of peritoneum is thus left uncut, and the cavity of the abdomen is afterwards more easily closed.”*

When the stricture is seated in the internal ring, Sir ASTLEY COOPER says, that he has occasionally practised the following method, and had recommended it in his lectures. “ The tendon of the external oblique having been divided a little above the external ring, the sac is gently drawn down, while the muscles are drawn up by an assistant. In this way the stricture is brought into view, and can be divided without risk, and without including the peritoneum. I was led to adopt this method by the result of a case related in a preceding chapter, in which I had reason to doubt whether the aperture in the intestine was not caused by the knife ; when the stricture is not in view, the intestines cannot be completely secured from danger : the knife is passed blindly upon the finger as a guide, and in dividing the stricture has been known to wound the intestine.

“ An advantage is derived from dilating the stricture without cutting the sac itself, for there is no danger of wounding the intestine with the naked end of the knife, which I have twice known to happen when the stricture was divided from within the sac ; in one case the patient died from the contents of the intestine escaping into the

* Part i. p. 38, 2nd ed.

cavity of the abdomen; in the other, the intestine was obliged to be retained in the sac to allow of the escape of the feces by the external wound.

“An additional advantage is derived from this mode of dilatation, viz. that if by any mistake of the operator the epigastric artery is cut, as the peritoneum is undivided, the flow of blood would be immediately perceived, and then the vessel might be secured; whereas if the sac is included in the incision, the artery would bleed into the abdomen, and the consequences might be fatal, without the cause being known but by dissection.”*

The mode of proceeding thus recommended by Sir A. COOPER, and executed by him with perfect facility, would be found difficult to those less intimately conversant with the anatomy of ruptures, and in some instances probably impracticable. It is therefore fortunate that we cannot regard it as a matter of much consequence. When the hernial sac has been freely laid open, we cannot suppose that the additional division of its neck will much increase the chance of peritonitis. If the stricture be divided in a proper direction, the epigastric artery is not endangered. Nor can the intestine be wounded if due care is taken to protect it by using a deeply-grooved director, or by carrying the curved knife along the finger. It may also be carefully held out of the way when the stricture is divided, either by the operator or assistant: or it may be covered at that time by the handle of a scalpel. Let me observe further, that the method of dividing the stricture on the outside of the sac, does not necessarily secure the protruded parts from injury. In an attempt of this kind recorded by PELLETTAN, the intestine was wounded.†

The question of eligibility between the ordinary course of proceeding and this modification must be determined, like all other practical matters, by experience. Unless unequivocal advantage should be found in the latter, I should not recommend its adoption, being unwilling to introduce, without absolute necessity, a new difficulty into an operation always requiring consideration and caution, and frequently attended with embarrassing circumstances. I speak in reference to the general adoption of this method: to one well acquainted with the relations of the parts, in their normal and pathological states, it will be easy to divide

* *Ibid.* p. 39.

† *Clinique chirurgicale*, tom. iii. p. 102.

the stricture in this way ; or, if the close connexion and adhesion of the parts should present an obstacle, the constriction may be removed by cutting from within in the usual manner.

If the practice in question could be rendered as easy as the common method of operating, it would still be necessary to consider its subsequent effect, in reference to the probable recurrence of the complaint, before we recommend its general adoption. In the former case, the neck of the sac, or the portion contained in the inguinal canal, and an inch of it below the ring, are left undivided ; thus a bag remains ready to receive any future protrusion. Would the chance of radical cure from the operation be diminished, and renewal of the complaint be rendered more probable, under such circumstances ? RICHTER, on the other hand, advises that the neck of the sac should be scarified in order to promote the adhesion of its sides. He found this practice so successful in promoting a radical cure, that he has recommended its employment in every operation for strangulated hernia.*

Replacement of the hernial sac.—It has been proposed to return the hernial sac into the abdomen, after it has been relieved from stricture. The notion has even been entertained that the sac might be separated from its surrounding connexions, and replaced with its contents.

After removing the stricture, without opening the sac, in the manner already described, PETIT advises the application of a compress or pad sufficiently large to cover the ring and its immediate neighbourhood. He says that he has had the satisfaction in many cases of seeing the sac gradually withdrawn within the ring ; that this always happens in small herniæ, and in those of moderate size, particularly when we push up as much as we can in the first instance.† He considers that the preservation of the sac entire is of material consequence in promoting the radical cure of the complaint. Having examined the bodies of several who had been cured of ruptures by wearing trusses, and without any operation, he found in some that the parts had become adherent to the portion of peritoneum, which had formerly constituted the sac ; that in others the membrane had become thickened, and adherent to the ring, spermatic cord, and surrounding parts, so as to form a firm

* *Traité des hernies*, p. 191.

† *Traité des mal. chir.* tom. ii. p. 332, 3.

barrier against the escape of the viscera ; while in those who had undergone operation, the parts were weak and unresisting, with the commencement of rupture or a disposition to it in many instances. He had so often seen hernia reappear after the operation, that he could not help ascribing it to the habit of opening the sac, or perhaps to neglecting the precaution of wearing the truss long enough after the cure.*

GARENGEOT, in describing the proceeding of PETIT, says “il entasse le sac en un petit bloc, et le met dans l'ouverture même de l'étranglement; et par dessus une petite pelotte qu'il a imaginée.” The elder MONRO adopted this view of the subject. He directs that the sac should be left entire, and pushed up into the ring, “if the disease is recent, with the sac thin, and not folded into wrinkles, or straitened where it is coming through the passages in the muscles, or *grown to any other part*.”† The direction of PETIT can only be understood as recommending that the sac should be pushed partially into the ring, like a plug, not as advising a reduction of it within the ring. MONRO speaks too of recent cases, and they must be quite recent, if the sac has not become adherent to the surrounding parts.

The instances in which the protruded parts with the sac covering them, that is, the entire hernial tumour, have been pushed into the abdomen in a mass, as in the cases cited in CHAP. V. SECT. 1, p. 92, and CHAP. VIII. SECT. 2, p. 150, seem to countenance the supposition that it might be possible to separate and replace the sac. Let me observe, in the first place, that these cases are rare, and that I have seen no instance of the kind. Sir A. COOPER relates the case of a female, in whom the sac of a small inguinal hernia with its contents was returned into the abdomen unopened.‡ A slight consideration of the anatomy will convince us that this proceeding can never be entertained as a general method. The universal and firm adhesion of the sac to all the surrounding parts ; its close connexion to the spermatic vessels ; and the difficulty of detaching it, particularly in the case of varieties in the position of the cord, will always constitute insuperable objections to such a proceeding ; which promises no particular advantage, even if it

* *Ibid.* p. 334, 5.

† *Edinburgh Essays*, vol. v. art. xxi.

‡ Part i. ; edit. 2 ; p. 66.

were easily practicable. That it does not secure the patient from a return of the disease is shewn by a case related by Sir A. COOPER. Mr. WELD, of Romford, was called to a female with strangulated inguinal hernia. "All attempts to reduce it having failed of success, the operation was performed of cutting down upon the tumour, separating it from its adhesions, and dividing the stricture. The sac and its contents were then returned into the cavity of the abdomen, as there was no reason to suspect the existence of mortification. The wound healed in the space of a fortnight, and the woman recovered. This operation was so far completely successful, and did Mr. WELD great credit; but he has since written to inform me that the hernia has reappeared, as the woman would not wear a truss upon a part which was still tender from the operation. However, she experiences no inconvenience from it, as it can be now readily returned into the cavity of the abdomen."*

SECTION V.—REPLACEMENT OF THE PROTRUDED PARTS.

Having sufficiently enlarged the stricture, we proceed to the principal object of the operation, that is, the return of the protruded parts into the cavity of the abdomen, which may be accomplished immediately, when they are sound and unadherent.

Intestine.—If the appearance of the intestine is suspicious, we should carefully examine its condition, particularly its colour, the thickness and consistence of its coats, and the state of the blood-vessels. We should draw out a fresh portion, so as to ascertain whether the tube has suffered at the point of constriction. This proceeding may facilitate the reduction by enabling us to press out some of the contents, which have distended the protruded part, and thus to diminish its bulk.

When the protrusion consists of a single small fold, or of a portion less than the entire diameter, we exert gentle general pressure, under which the part slips up at once, the contents having previously passed in with a gurgling

* Part i. p. 66. ed. 2.

noise. Should there be a larger portion of the canal out of the belly, we empty it by general pressure, and then replace the emptied intestine, portion by portion, beginning with one end near the ring, and proceeding gradually to the other. We take a portion of bowel between the finger and thumb of the right hand, and push it through the ring, preventing it from coming out again by pressure on the aperture with the finger and thumb of the left hand; and we repeat this process until the whole of the bowel is replaced. If the return cannot be effected without forcible pressure, we rather enlarge the incision of the stricture than run the risk of injuring the part by violence.

Sometimes the intestine, although it can be returned, does not remain in the cavity: we push in a portion, but a fresh piece comes out at the opposite end of the fold. This inconvenience arises from distension of the abdomen; the intestinal canal is enlarged and filled above the stricture; the muscular parietes are tense, and thrown into a kind of convulsive and almost involuntary action by the pain of the disease and the operation. The parts can be relaxed by bending the thigh, by bending the head and thorax forwards; we must wait a little, and endeavour to encourage and tranquillise the patient.

Changes in the state of the intestine.—In operations of this kind, the intestine is seldom found in its normal state: sometimes it is inflamed; more frequently it is discoloured from impeded circulation without inflammation.

Inflammation.—An inflamed intestine is preternaturally red, the redness being of a pink or scarlet tint; the vessels are distended; the coats thickened by interstitial effusion; the sensibility is increased. Lymph is generally effused on the surface.

Discoloration from strangulation.—When the intestine is truly *strangulated*, that is, when its circulation is affected by the stricture, the degree of discoloration and thickening will depend on the more or less effectual operation of the pressure; which may act on the veins alone, or on the veins and arteries; which, at first, merely impedes the passage of the blood, but ultimately causes complete stagnation. The intestine is deep red, brown like the tamarind stone, reddish brown, or chocolate coloured, dark livid; and these red, brown, and livid tints pass, by intermediate shades, into black. Such discoloration is produced rapidly when the stricture is tight: I

have seen several inches of small intestine of a dark livid hue in eight hours from its descent. The change of colour is accurately bounded by the stricture, beyond which the bowel has its normal appearance. The coats of the intestine are at the same time thickened, so as to give it a firm fleshy feel.

Distinction between this discoloration and mortification.—The darker kinds of the discoloration now alluded to are commonly mistaken for mortification; and the operator, not understanding the nature of the change, experiences embarrassing doubt whether intestine thus altered should be returned into the abdomen. The distinguishing circumstances are clear and easily understood. The black colour is not an evidence of mortification; still less the other tints, however dark. Mortified intestine is of a dull straw or grey slate colour at first; afterwards somewhat darker. The change of colour in this case is from cessation of circulation, the arrest of all vital movement; we see no blood, and discern no blood-vessels: in the strangulated bowel it arises from congestion in all the vessels, which are preternaturally filled with blood; from impediment to the circulation, or stagnation of the blood, which assumes the dark venous hue; and from infiltration of blood in the texture of the intestinal coats.

The mortified portion of bowel loses its polished surface, and has a dull dead look; the serous membrane easily peels off; its consistence is soon changed; it becomes soft and tears easily; the tube collapses, the coats undergo a kind of dissolution, and send forth an offensive cadaverous odour. In the early period, there is a sharp line marking the boundary of the dead and the living, and pointing out clearly the nature of the change.

In the discoloration from strangulation, the intestine retains its smooth and shining surface, its consistence, and its tubular form. The serous membrane cannot be detached. The coats being thickened, feel more fleshy and firmer than usual. Hence the part is actually enlarged, and sometimes considerably.

When we can see the blood-vessels, if we press forward their contents, and find that they fill again, we may be sure that circulation has not ceased. But, if the blood be stagnant or coagulated, we cannot therefore conclude that gangrene has occurred. This criterion is not available in

the black discoloration with thickening of the coats, as the vessels cannot be distinguished.

In a doubtful case we might gain some information by covering the intestine with a warm sponge or cloth, and waiting a little. The circulation, freed from the impediment of the stricture, might become more active, and thus produce visible improvement in the colour of the bowel.

Intestine discoloured by strangulation should be returned.—It is not only safe, but advantageous, to return into the abdomen intestine which has become inflamed, or changed in colour by strangulation. When its exciting cause has been removed, the local disturbance may be expected to cease; and nothing can be so likely to restore the normal state of structure, circulation, and function of the inflamed or strangulated intestine, as the replacing it in its natural abode. We may, perhaps, lay down the rule that no change of appearance should prevent replacement, except that which indicates mortification: the records of surgery abound with cases clearly showing the propriety of this practice. Thus intestine has been successfully returned, when resembling a tamarind-stone in colour,* and when it has been dark brown.† SCHMUCKER‡ replaced more than an ell of a black brown colour with fortunate result; and a patient recovered, in whom ACREL§ returned half an ell of a colour nearer to black than brown.

BARON DUPUYTREN|| found the convolution of intestine in a crural hernia of the deepest ebony black, but concluded that it was not mortified, for the texture had its natural firmness; the serous tunic could not be detached; there was no stricture nor impression at the point of strangulation; and the neighbouring part of the gut had its natural colour. He therefore replaced the part. The patient died of acute peritonitis. The gut, which had been protruded, was found still black, but without any perforation.

Having repeatedly returned into the abdomen with favourable result deeply discoloured intestine, that is, when the part has been of a deep chocolate brown, dark livid, and nearly black tint, I entertain no doubt respecting

* *Medical and Physical Journal*; vol. x.

† WARNER'S *Cases in Surgery*; Case xxxix.

‡ *Chirurgische Wahrnehmungen*; b. ii. p. 293.

§ *Chirurgische Vorfälle*; b. i. p. 395. See also THEDEN, *Neue Bemerkungen*; 4th. i. p. 95.

|| BRESCHET, *Considérations sur la hernie fémorale*; Obs. x.

the propriety of the practice, which is exemplified in the following instance.

CASE.—THOMAS LUCAS, a negro, was brought into ST. BARTHOLOMEW'S Hospital, with a strangulated bubo-nocele, on the morning of the 14th of January, 1807. The incarceration had taken place on the preceding evening at ten o'clock. Cold applications, continued for the space of four hours, and combined with the repeated use of tobacco-clysters, having proved ineffectual, the operation was performed by Sir C. BLICKE at twelve o'clock. The case proved to be an intestinal rupture; and the strictured bowel for the length of two inches was, in the whole of its diameter, of the darkest brown and almost black colour: this portion was distinguished from the sound gut by a defined line. It was returned into the abdomen; but the circumstance of the deep and extensive discoloration was considered so unfavourable, that the patient was not expected to survive. Symptoms of enteritis having appeared within a few hours from the operation, sixteen ounces of blood were taken from the temporal artery; and the bleeding was repeated soon after to the same amount. The blood was drawn from this vessel in consequence of the superficial veins of the arm being so unusually small, that, although they were opened in several places on both sides, no blood flowed from them. With this evacuation were combined the use of warm fomentations to the abdomen, the internal exhibition of sulphate of magnesia and manna in mint-water, and clysters. On the following day thirty-six leeches were applied to the abdomen, and sixteen ounces of blood were taken from the arm. These measures subdued the inflammation, but exhausted and weakened the patient to such a degree, that a nutritious diet, together with porter, wine, &c., was required for his support. He had completely recovered, and left the house, about the middle of March.

Whether intestine discoloured by strangulation should be returned in all cases.—A French surgeon, M. I. A. JOBERT (DE LAMBALLE,) who has taken much pains in investigating the surgical pathology of the intestinal canal, and has elucidated, by experiments on animals, the alterations in the intestine caused by strangulation, agrees in the general statement that the black colour of the intestine is not a sign of gangrene, and that it does not contraindi-

cate replacement in the abdomen: * but he considers that this change leads to the loss of vitality, and consequently that it would sometimes be improper to return a portion of intestine, even although it should not be mortified.

He gives the following account of the effects produced in the intestine of the dog by strangulation. When a convolution is surrounded by a ligature tightened so as nearly to interrupt the venous circulation, the intestine first has a violet tint, then becomes black, perhaps as dark as ebony. As blood still arrives by the arteries, although it stagnates in the veins, the bowel increases in volume and becomes heavier; it resists pressure, the coats do not collapse, and the tubular form is preserved. If we divide the intestine, liquid blood flows out, which had been exhaled from its mucous surface, and on slitting the tube open, we discover coagulated blood in successive strata. After carefully removing this, we find no rupture; I therefore conclude that the blood has been exhaled. It is also infiltrated between the tunics in variable quantity, sometimes so abundantly, as to elevate the serous membrane irregularly. The blood thus poured out may be removed, so that the intestine may recover. If the experiment is carried further, perforations take place, and the animal perishes. The effused blood becomes softened, the mucous and muscular membranes are inflamed and give way, and the serous tunic is torn. We have openings with irregular torn margin, infiltrated with blood, and without any unpleasant odour. Effusion into the cavity, and death, are the consequence of such changes. †

* “ L'intestin est noir, faut-il le réduire? Je pense que sa couleur ne peut pas être regardée comme un caractère de la gangrène, je ne pense pas aussi qu'elle puisse être une contr'indication à la réduction. On a vu très souvent des intestins noirs une fois réduits revenir parfaitement à leur couleur naturelle, et aucun accident n'être la suite de leur rentrée dans le ventre.” *Traité théorique et pratique des maladies chirurgicales du canal intestinal*; tom. i. p. 464.

† The following are the details of two experiments made by M. JOBERT. “ I surrounded a fold of intestine in a dog with a thread drawn sufficiently tight to impede the free passage of the blood in the veins. Vomiting was produced almost immediately, and recurred frequently. It diminished towards the evening, when the animal, though depressed, did not suffer much. There was no reason to suppose that mortification had occurred. On examining the body, the omentum was found adhering to the opening in the abdomen by a mass of lymph. The intestine was twice its ordinary thickness, and of an uniform deep black, as far as the ligature. The serous membrane was raised at different points by blood effused under it: these elevations would have given way and thus caused dangerous effusion. When the

When M. JOBERT operated on animals, so as to be able to withdraw the ligature at pleasure, he found that the dark coloured intestine would recover if he took away the thread before enteritis had occurred. And he observed a favourable result of analogous character in a patient operated on by M. RICHERAND.

CASE.—A patient came to the hospital St. Louis with an inguinal hernia strangulated for twenty-four hours. The complaint had existed from early infancy, and the parts had been kept up by a truss: this had been left off, the intestine descended, and became strangulated. When the sac was opened, there came forth a large quantity of blood, or at least of bloody serum. The intestine was unadherent and black; its temperature was diminished, the surface still smooth and shining; it was greatly increased in size, (triple de volume,) firm, so as to resist pressure, and preserved its tubular form. There could be no doubt that these changes depended on accumulation of blood in the cavity, and its infiltration in the intestinal coats. Reduction was accomplished easily after the stricture had been removed: the latter measure was hardly necessary but for the fear of rupturing the enlarged and distended bowel. By means of general and local bleedings and purgatives, this patient recovered.

M. JOBERT relates two cases to show the danger of returning the intestine when it has been greatly distended with blood, and to prove that the coats, under such circumstances, may become softened and give way, although mortification has not occurred. In one of these DUPUY-TREN returned the intestine, which was black and thickened, but retained its tubular form, and was distended

strangulated portion was cut across, a considerable quantity of black liquid blood flowed out; it had been deposited partly in the cavity, partly in the substance of the parietes. Firm layers of black blood could be scraped from the internal surface of the bowel. The convolution was cold from the cessation of circulation. It was not mortified, for it preserved the tubular form, and had not become flaccid. When it had been placed in water, and the blood had been squeezed out, the intestinal tunics presented nearly their normal appearance.

“ In a second experiment performed in the same manner, the animal was examined at the end of twenty-four hours. The abdomen contained a larger quantity of black blood. The constricted fold of intestine was as black as ebony, and presented a perforation resulting from one of the elevations noticed in the preceding experiment. This had been the source of the effusion. This perforation was simply a rupture from distention: it had not arisen from gangrene, for the irregular margins had no unpleasant odour. The peritoneum was inflamed.” P. 44—46.

with gas. The patient died on the next day, when the intestine presented a slit of some lines, through which the intestinal contents had become effused into the pelvis. Hence he concludes that the intestine ought not to be replaced when it is greatly distended by effused and infiltrated blood, and particularly if the surface should present irregular elevations from this cause.*

Discoloured intestine does not always recover when replaced.—When deeply discoloured intestine is returned into the cavity, it does not always regain its healthy state: we sometimes see reason for believing that it has not resumed its functions, and that it has been the source of serious inflammatory mischief. The circulation may undoubtedly have been so far interrupted, as not to admit of recovery; and thus the part may perish after it has been replaced. If we should see reason to fear such an occurrence, we might depart from the general rule, of returning into the belly intestine which is discoloured, but not mortified. I have never found it necessary to take this course. If such a case should occur, we must deal with the intestine as if it were mortified.

The pressure of the stricture may have caused softening of the tunics and perforation of the intestine. The conduct to be pursued in that case will be considered in CHAP. XVI. SECT. 3; on the operation for strangulated femoral hernia.

Wounds of the intestine.—The intestine has been sometimes inadvertently wounded in dividing the stricture, a circumstance easily accounted for when we consider that the hernia knife is passed in contact with parts so closely confined as not to admit of its being guided by the finger, and hardly to allow even the introduction of a director; and that this part of the operation is usually performed out of sight. The possibility of such an occurrence will teach us a lesson of great caution, and inculcate the propriety of endeavouring, by a free division of the external parts, and by drawing down the neck of the sac, to bring the strictured portion into view, and thus to avoid wounding the protruded part.

A superficial wound, that is, one which does not penetrate the cavity, is of no consequence: the intestine may be returned without the slightest fear of unpleasant results.

* *Ibid.* tom. ii. p. 29—37.

Penetrating wounds, however small, are much more serious.* If the intestine were returned, they would give rise to effusion of its contents, an occurrence which, in the great majority of instances, has been rapidly fatal. This observation does not apply to a simple puncture, where the opening is so inconsiderable that the sides remain in close contact, and nothing escapes. It is possible that an intestine might be returned with impunity, with a very small incised wound; the bowel might become adherent to an opposed peritoneal surface, so as to close the opening and prevent effusion.† If the latter event, however, should take place, the consequences are so serious, that we are not justified in exposing the patient to the risk: and we ought not, therefore, to return a portion of intestine with an opening, through which matters contained in the canal could possibly escape.

When a small opening is found in the intestine, we should pinch up the aperture with the forceps, tie it tightly with a silk ligature, cut off the ends close to the knot, and then return the bowel. The results of two cases, in which I did this, showed that no inconvenience or danger resulted from the opening in the bowel.

CASE.—JOHN SHALL, sixty years of age, was admitted into ST. BARTHOLOMEW'S Hospital, under my care, on the 2nd of November, 1826, with strangulated inguinal hernia. The complaint had existed thirty years, during which he had worn a truss, but there always existed a swelling in the scrotum as large as an egg. At five in the afternoon

* I cannot agree with RICHTER in considering such injuries unimportant. After alluding to a case, in which a surgeon had wounded the intestine, and, being unwilling to employ sutures, had proceeded to divide it completely, and established an artificial anus, which he rightly characterises as *remedium pejus morbo*, he adds, "an incision in the intestine is not so very dangerous an affair; and does not always require suture. I have sometimes seen that such small wounds of the intestine in operations for hernia were little thought of and were unattended with danger. It is sufficient in general to keep the intestine near to the opening in the belly, so as to prevent effusion of the contents into the cavity."—*Chirurgische Bibliothek*; b. iv. p. 159.

† M. JOBERT says, that he had often made an opening of three lines in length in the intestine of a dog and returned it. Cicatrisation was always accomplished by the intervention of the omentum, which was found between the edges of the wound in the form of a small plug visible from within. *Maladies chirurg. du canal intest.* tom. ii. p. 67. In reference to the human subject he says, that the intestine may be returned without suture if the wound does not exceed three lines. *Ibid.* p. 72. We are not hitherto warranted by experience in pronouncing this to be a safe practice. In case of such an opening in the intestine, I should employ suture; not considering it safe to return the bowel into the abdomen without this precaution.

the swelling suddenly increased towards the groin, in consequence of some exertion: it became painful, and he was seen by a surgeon, who administered an aperient, and endeavoured to replace the parts without success. He was brought to the hospital at eleven o'clock, with all the symptoms of strangulation strongly marked. The tumour was oblique, commencing at the upper opening of the inguinal canal, and extending through the lower aperture to the scrotum. It was hard and painful in the former situation, less tense and sensible in the latter. Tenderness extended over the whole belly, which, however, was soft; and there was a feeling of tightness across the navel. There was constant nausea, with occasional vomiting: the pulse was small and frequent. The following means were immediately resorted to: viz. venesection to thirty ounces, the warm-bath, and tobacco clyster. As these produced no favourable alteration, I proceeded to operate at one in the morning of Nov. 3; eight hours after the bowel had come down. When the external coverings of the swelling had been divided, the finger could be passed under the tendon of the external oblique, and under the margin of the transversus: hence it was obvious that the stricture was caused by the neck of the sac, which was felt encircling the protruded parts like a tight cord. When the peritoneal covering was opened, not a drop of fluid was found in the hernia, probably from the recent occurrence of the descent. The swelling contained a portion of small intestine in front, and a large mass of omentum behind. The intestine was six or eight inches long, and of a dark chocolate colour. A small silver director having been introduced with some difficulty into the stricture, it was divided directly upwards with a curved probe-pointed bistoury. On withdrawing the intestine gently, it was found deeply marked at the seat of stricture with a circular impression, as if it had been tied with a cord; its calibre was lessened, and its coats were thinner at this part. A considerable escape of thin inodorous fluid took place when the gut was drawn down. At first this seemed to come from the abdomen, but, on closer examination, a small opening was found in the intestine just above the strictured part, and I inferred, although the point was by no means clear, that it had been wounded by the curved bistoury. I held together the sides of the aperture, which was very small, with the dissecting forceps; it was tied

firmly with a small silk, of which the ends were cut close to the knot. Although the omentum had been so long out of the abdomen, and pressed on by a truss, it could be unfolded, and thus presented its natural structure: it adhered firmly to the lower part of the sac. Its bulk and long absence from the cavity rendered its return into the abdomen both difficult and unadvisable; I therefore cut it off below the neck of the sac, tied six or eight vessels, which bled freely, and left the part thus tied in the wound. The integuments were brought together by three or four sutures assisted by strips of plaster. A small dose of senna mixture was given two hours after the operation, with directions for its repetition until the bowels should be moved. Nov. 3, twelve o'clock. Has had some rest. The bowels have been open; the tongue is clean; pulse 90, hard and quick. Venesection to twelve oz., a saline draught with one dram of sulphate of magnesia every six hours. 4th. The blood taken yesterday is healthy; a good night; countenance improved; tongue clean and moist; pulse 70. Nov. 5. Restlessness during the night; pulse harder and more frequent; face flushed; tenderness in the neighbourhood of the wound: thirst, tongue foul at the back; bowels open. Venesection to fourteen oz.: the medicine continued with *Liq. ant. tart. m.xx* in each dose. 6th. Blood not inflamed; pulse 70, and quiet; tongue clean; the wound and its neighbourhood quite easy; the sutures removed: the bowels rather confined. An aperient draught, to be repeated, if necessary. 7th. Flatulency with dark and offensive motions; pulse quiet. *Hydr. c. creta gr. v. Pulv. rhei, gr. x.* The saline medicine continued. 10th. Going on favourably in all respects; appetite returned. 13th. Ligatures came away from the omentum. 16th. He is quite well, and only waits till the cicatrix is firm enough to bear the truss.

In another case, in which the intestine was decidedly wounded, I pursued the same plan. It was a large enterocoele, with the bowels greatly distended, and the abdomen very tense, so that it was difficult to replace the parts and to keep them in the belly. The symptoms were not relieved by the operation, and death ensued within two days. The ligature was completely covered by a thin smooth layer of lymph, and so concealed, that there was some difficulty in finding it out the small wound in the intestine was closed.

Sir A. COOPER has related a case of strangulated inguinal hernia, in a patient of twenty-one, operated on in Guy's Hospital, within a few hours after the descent of the bowel. When the stricture, which was at the mouth of the sac, had been divided, "a fluid of yellowish colour escaped, and in turning up part of the intestine an opening was found in it from which fluid escaped, which was immediately secured by laying hold of it with a pair of forceps, and then tying it with a ligature:" the intestine thus tied was replaced in the abdomen. This patient recovered in five weeks, after passing through the greatest danger.*

If the intestine should receive a larger wound, it might be necessary to employ two or more points of suture, or to unite the divided parts by the uninterrupted suture. Experimental researches on animals have afforded us interesting information respecting the processes employed by nature under such circumstances, and have clearly established the principles that ought to regulate our conduct when suture of the intestine is required.

If a portion of the intestinal coats in a dog be pinched up with a pair of forceps, and tied tightly with a ligature, of which the ends are then cut off close to the knot, the gut becomes adherent to some contiguous peritoneal surface, and the included portion, as well as the ligature, falls into the canal. If the edges of a divided gut be approximated by sutures penetrating all the coats, and cut off close, the wounded bowel becomes included by a deposition of coagulating lymph, which unites its cut edges, so that the division is not visible externally, and the sutures, when loosened by ulceration, fall into the canal. The same process takes place when the divided ends are united by an uninterrupted suture.† These facts lead to the inference that we might close a wound in the intestine with two or more silk ligatures penetrating all the coats, and cut off the ends close to the knots: or an uninterrupted suture of fine

* Part i. 45—47.

† Dr. JOHN THOMSON of Edinburgh first noticed the curious fact of the inclosure of the ligatures by coagulating lymph, and their discharge into the canal. See Sir A. COOPER's *Anatomy, &c. of Inguinal Hernia*, chap. ii.: in which Dr. THOMSON's experiments and some of his own are related. There is an inaugural Essay on the subject by a Dr. SMITH, published, I believe, in America; but I have not seen it. Mr. TRAVERS's *Inquiry into the Process of Nature in repairing Injuries of the Intestines*, contains the most copious illustration of the whole subject; and is accompanied with plates.

silk might be used, the end being in like manner cut off close.

Another mode of uniting those wounds, in which the sutures are so applied as to bring the serous surfaces of the injured part into contact, has been devised by Mr. A. LEMBERT,* who has described it in the second volume of the *Répertoire général d'anatomie et de physiologie pathologiques*, &c. 1826. He employs the interrupted suture, leaving between the stitches intervals of four or five lines, and not tying the ends until all the threads have been introduced. The needle enters at two lines from the edge of the wound, and either pierces the whole thickness, or passes between the muscular and mucous coats of the bowel: it is then brought out again at one line from the edge. This proceeding is reversed on the opposite side of the wound; that is, the needle enters at one line, and is brought out again at two lines from the margin. When the threads thus placed are drawn, the edges of the wound are inverted towards the cavity of the intestine, and the portions of serous surface embraced by the ligatures are brought into contact. These points will be more readily accomplished, if a probe or director be placed on the middle portion of the ligatures, and withdrawn as the threads are tied. The ends of the ligatures are to be cut off close to the knots, one being left, and carried out at the external wound. The knots, which are left, pass into the cavity of the intestine, having been covered, in the first instance, by the layer of plastic lymph, which forms the uniting medium of the wound.

“This operation,” says Mr. LEMBERT, “when performed on dogs, is attended with so little danger, that I have several times known the animals to eat, digest, and expel feces the day after its performance. They show at first a little weakness and want of appetite, but recover their usual liveliness and vigour in forty-eight hours. Five dogs were operated on, and all recovered. In one, which I killed three days after a complete transverse division of the intestine, the wound was completely united, and the knots of the sutures had disappeared.

“The following are the advantages of this method: 1stly, facility and promptness of execution; 2ndly, appli-

* *Mémoire sur l'entéroraphie, avec la description d'un procédé nouveau pour pratiquer cette opération chirurgicale*; with figures to illustrate the application and effects of the sutures.

cability to all wounds of the intestinal canal; 3rdly, freedom from all danger of bleeding; 4thly, effecting an union so complete that even air does not pass, as I have found on inflating an intestine, when thus tied in the dead body; 5thly, that the constriction attendant on it is confined to a small portion of the coats, and excites no more irritation than is necessary for the deposition of plastic lymph; 6thly, that it leaves behind no change in the bowel capable of interfering with its functions; and that the recovery is prompt."

The valve-like prominence, which the edges of the wound make in the cavity of the bowel, does not impede the passage of the alimentary contents at first; and it subsequently disappears or is diminished.

This method of enteroraphy was employed successfully by M. J. CLOQUET in the following instance of a wound inflicted on the intestine in the operation for strangulated hernia. NICOLAS LEJEUNE, forty-one years old, came into the hospital ST. LOUIS on July 13, and left it cured on the 12th of August. He had a large congenital hernia, which had become strangulated. The sac contained intestine inflamed and enormously distended. The stricture was formed by the neck of the sac. M. CLOQUET divided it, but could not return the bowel. He introduced the bistoury again, to make a further division, and found, on withdrawing it, that the intestine had been cut in the extent of an inch and a-half. He employed an ordinary needle, entering it about five lines from the cut edge, and bringing it out again at one line: then having carried it in the same way through the other side, he easily inverted the edges of the wound, and brought the serous membranes in contact. He employed two points of suture, fastened them with a double knot, and when satisfied that nothing escaped, cut off the ends of the sutures close, and returned the bowel.*

M. JOBERT adopted the same plan in three cases of wounded intestine, one of which occurred in the operation for strangulated hernia.

CASE I.—A man, twenty-three years of age, was stabbed in the abdomen with a knife: A portion of intestine protruding at the wound, had been cut in two places. One of the wounds was transverse, and ten or twelve lines in length; the

* JOBERT, *Maladies chirurg. du canal intestinal*; tom. i. p. 80.

tunics being completely divided only to the extent of six or eight lines. It was united by four points of suture in the following manner. A common needle, with a simple thread, was carried into the parietes of the gut at three or four lines from the edge of the wound, and brought out again, at half a line from the edge: it was then introduced at half a line from the edge of the opposite side, and brought out at three or four lines from the same edge. The other threads were introduced in the same way. The extremities of each thread were then twisted together; the result of which was, that the margins of the wound were brought into contact by their external surfaces, serous membrane being applied against serous membrane. These threads were then held by an assistant, while the longitudinal wound, ten or twelve lines in length, was united in a similar manner by eight points of suture. The intestine was then replaced in the abdominal cavity, the ends of the sutures being retained on the outside. The patient died in thirty-eight hours in consequence of effusion into the abdomen from other penetrating wounds of the intestinal canal. The sutures in the wounds of the intestine were covered by a layer of lymph, without any appearance of pus. No thread was visible on the interior; nor was there any interval between the edges of the wounds. The longitudinal wound formed a projection of two lines in height. The edges of the wounds still remained in contact, when the threads had been removed: on dragging them apart, they were found to have been united by plastic lymph.

CASE II.—A patient with a large irreducible scrotal hernia received a violent blow on the swelling, followed by symptoms indicating injury of the intestinal canal. A wound of the intestine was discovered on opening the tumour, and united, in the same manner as in the former case, by two points of suture. Death ensued in the night after the operation. The edges of the intestinal wound were found united by plastic lymph, as in the other instance.

CASE III.—In operating on a crural hernia, in a lady fifty-four years of age, a wound was inflicted on the intestine, which was obscured by adhesions. When the latter had been destroyed, a portion of the bowel was drawn out of the abdomen, exhibiting a deep mark from the constriction of the crural ring. M. JOBERT then determined on closing the wound of the intestine by sutures applied in the

manner already described: he did this, and returned the intestine, leaving the ends of the sutures hanging out in the wound. One of the threads came away on the fifth day, and another on the seventh. The wound was cicatrised in a month: at the end of three months the patient was in excellent health, the functions of the alimentary canal being performed without any irregularity or impediment.*

Other instances are on record, in which wounds of the intestine have been successfully closed, either by the uninterrupted, or by the ordinary interrupted suture. Thus, in a protrusion of the small intestine, presenting an aperture that would admit the finger, the latter was united by the uninterrupted suture, and the bowel returned. The alvine discharge was performed naturally, and the patient was well in six weeks.† A wound of the colon, in a young man eighteen years of age, was closed by the glover's suture, and the patient recovered.‡ In another case the wounds of the intestine were closed in the same way with a fortunate result.§ A complete division of the ileum, in which the wound extended into the mesentery, was treated by the interrupted suture. The ends of the divided bowel were united by four ligatures of double silk, passed through all the coats, and drawn tightly, the ends being then cut close to the knots, and the part returned, together with a large portion of the intestinal canal, mesentery, omentum, and stomach, which had been protruded at the same time. The judicious conduct of the surgeon saved the patient, though with difficulty, from this extensive and complicated injury. ||

Return of the omentum.—This part must be unfolded and carefully examined, to ascertain whether it is in a state fit to be returned. If we find it healthy, particularly if it be of moderate size, and has not been long protruded, we replace it, exerting gentle general pressure if it be a small portion; passing it up bit by bit, like the intestine, when there is a larger mass, and taking care to follow it

* Mémoire sur la suture intestinale, avec trois observations d'entérophie pratiquée par M. JOBERT; par L. FLEURY. *Archives générales*; March 1837.

† *Philosophical Transactions*; vol. i. p. 35.

‡ GLANDORP, *speculum chirurgicum*; Obs. 34.

§ *Journal de Médecine de M. LE ROUX*; tom. xxvi. p. 448.

|| *Edinburgh Medical and Surgical Journal*; vol. xii. p. 27.

with the finger, so as to ascertain that it fairly re-enters the cavity.

The changes which the omentum undergoes in ruptures, and the mode of treating it when thus altered, will be considered in the chapter on Omental Ruptures.

The omentum usually presents first in an entero-epiplocele, covering the intestine; we should therefore unfold and carefully examine it, as a portion of gut is often concealed under it; and we should not proceed to remove it until such examination has been effectually made. Instances have occurred, in which the omentum has formed a complete bag, including a portion of intestine: * in such a case it must be divided sufficiently to expose the gut. The possibility of such an occurrence should make us proceed very cautiously in cutting away portions of omentum. We occasionally find the intestine in front and the omentum behind. This may be expected where the rupture has originally contained omentum, which has become adherent to the back of the sac. The adhesions may be so situated that a portion of bowel protruded subsequently must pass in front of the omentum. I operated, in St. BARTHOLOMEW'S Hospital, on a patient seventy-six years of age, who had been the subject of inguinal hernia for forty years, and had lately supported the swelling by a suspensory bandage. Without any apparent cause pain came on in the tumour, and extended over the abdomen: it was accompanied with constipation and vomiting. On opening the swelling, a portion of small intestine with its mesentery presented, and behind it there was a large mass of thickened omentum adhering to the posterior surface of the sac. In the case of JOHN SHALL, already related, (see *ante*, p. 301) the front of the hernia was occupied by intestine, the back by adherent omentum. As intestine goes up with greater facility, and as it is naturally situated behind the omentum, we usually return it first in an entero-epiplocele. The omentum, which goes back less readily, and often requires partial removal, remains for our disposal. There is, however, no invariable rule on this point.

Changes in the omentum causing stricture.—The omentum, variously altered in structure and arrangement, and sometimes adherent to the sac, may be the cause of

* RICHTER, *Traité des hernies*; p. 133. The two cases related by Mr. HEY seem to have been in some respects of this kind. *Practical observations*, pp. 211 and 214.

stricture, the abdominal ring being free. SCARPA has minutely described and delineated several occurrences of this kind. The part contained in the neck of the sac, which is often thickened, becomes adherent. It crosses in front of the bowel, and is attached to the posterior surface of the sac, the edge immediately covering the intestine becoming indurated, and assuming a kind of fibrous texture.* The hard margin of omentum thus fixed by adhesion at its two extremities, and embracing the intestine in two-thirds of its circumference, may cause strangulation, if the intestine below should become distended by its contents or increased in bulk by a further descent. ARNAUD † met with a case of this kind, in which the intestine was also adherent to the omentum: on separating the adhesion, the bowel could be returned without difficulty. An opening is sometimes found in the protruded portion of omentum, with a thick and firm margin; the intestine, coming out of the ring behind the omentum, passes through the preternatural opening, and thus presents in front, when the sac is laid open.‡ ARNAUD § and CALLISEN || found it strangulated in this way in operations. Again, the omentum, adhering to the neck and fundus of the sac, may be changed into a thick firm cord passing over the bowel: ¶ or the same effect of constriction and strangulation may be produced by other changes of a similar, but more complicated nature, the details of which will probably vary in each case.**

Adhesions.—The contents of a rupture often adhere to each other, or to the hernial sac. Such preternatural connexions are seldom strong between intestines: the most close and intimate connexions are those between the protruded parts, the omentum more particularly, and the sac.

The form and consistence of the adhesions vary considerably, these varieties depending principally on the length of time they have subsisted; in which respect they are distinguished as *recent* or *old*. The parts may be agglutinated by a soft semi-transparent medium, easily separable by the finger. The uniting substance in this case, which is

* *Sull'ernie*; Mem, 2; § 15, tab. v. fig. 1.

† *Mémoires de chirurgie*; tom. ii. p. 577.

‡ SCARPA, *ibid.* § 18, tom. v. fig. 2.

§ *Lib. cit.* p. 588.

|| *Acta Hafniensia*; tom. i. p. 164.

¶ SCARPA, *ibid.*

** SCARPA, *ibid.*; § 18. tav. vii. § 17, tom. v. fig. iii.

a very thin stratum, is the organisable or plastic lymph so readily effused by inflamed serous surfaces. Supposed to be inorganic at the time of its deposition, this lymph is soon penetrated by blood-vessels, and thus converted into organised adhesions. A case related by Sir EVERARD HOME, in his *Treatise on Ulcers*, shows in how short a time lymph may be thus effused and become organised. In a man operated on for intestinal hernia, the intestine was returned, and death ensued in twenty-nine hours. The gut, which had been protruded, was found connected to the surrounding parts by lymph; its blood-vessels were injected, and the injection passed into minute vessels in the lymph. The inorganic medium, instead of closely agglutinating parts, is sometimes effused partially, but in larger quantity, so as to render the surfaces rough and shaggy. Sometimes the lymph has a more or less cellular arrangement, with serous effusion in the interstices. When the lymph has become organised, it is converted into a texture closely resembling serous membrane, which, in the shape of threads or plates of various length and breadth, unites the corresponding surfaces more or less closely. Or it may cause a close and firm adhesion between the viscera and the sac, of greater or less extent, with an appearance of complete consolidation. Thus PETIT speaks of adhesions being so firm and general, that the hernia constitutes a fleshy mass without distinction of intestine or epiploon.* In a small crural hernia, Mr. TAUNTON found the sac adhering so firmly to the intestine, that they could not be separated.† I met with a similar state of parts in a crural enterocele; at the mouth of the sac, the surface of the latter and that of the intestine formed a continuous membranous expansion, and the end of a probe even could not be introduced. In dissecting away the adventitious production, which thus united the parts, it seemed like removing a tunic of the intestine.

SCARPA‡ employs particular terms to denote the various forms of adhesion just mentioned; calling that by unorganised lymph, *gelatinous*; the connexion by threads or plates, *filamentous* or *membranous*; and the close consolidation, *fleshy* (*carnosa*.) He makes two species of fleshy adhesion; the *preternatural* or diseased, and the *natural*.

* *Traité des mal. chir.* tom. ii. p. 277.

† *Philosophical Magazine*; vol. xxxvi. p. 316.

‡ *Sull' ernie*; Mem. ii. § 23.

The latter is exemplified where the cæcum and sigmoid flexure of the colon descend, retaining their natural connexions behind and at the sides.

In order to accomplish the return of the protruded parts, it is necessary to destroy their preternatural connexions to each other and to the sac, more especially the latter. The removal of the former may not seem absolutely necessary, but it is desirable; the agglutination of the two sides of an intestinal fold is said to have caused a sufficient obstruction to induce a fatal termination.*

Recent and tender adhesions may be lacerated by the finger: the firmer connexions of membranous consistence must be separated by the knife; close fleshy adhesions may require a careful dissection. Mr. POTT never found the protruded parts in such a state of adhesion as to be incapable of being returned; but ARNAUD relates cases, in which the adhesions could not be destroyed.†

A portion of intestine might be so closely adherent, as not to admit of its being separated without danger of injury; and we must admit that, when detached by a tedious dissection, it would not be in a favourable state for replacement. It might be the safest course under such circumstances to leave the intestine in the wound, taking care that it should be relieved from the pressure of the stricture, and then to cover it by gently approximating the integuments. SCARPA strongly recommends this course of proceeding in all such instances; and he represents that an adherent intestine, thus left out of the belly, will be gradually drawn up towards the ring, together with the sac, in the course of the cure, and that it will sometimes pass even into the aperture. He pursued this plan on a man, fifty years of age, afflicted from his youth with a scrotal hernia of the left side, for which he had never worn a truss, though he had been for some time much troubled with colic. Under an effort in lifting a weight, incarceration took place, with considerable increase of the swelling. Having divided the stricture, and returned the parts recently protruded, SCARPA found the intestine adhering so closely to the back part of the sac, about an inch below the ring, that he could not have separated it without an extensive and dangerous dissection.

* Sir A. COOPER; p. 53.

† *Mem. de chirurgie*, tom. i. p. 54.

He therefore left it alone, and brought the sides of the sac together over it, directing that the parts should be kept constantly moist with rags dipped in the decoction of marshmallows. Suppuration was completely established on the sixth day, and the intestine had approached a little towards the ring. In three days more the bowel was reddish and granulating. On the thirteenth day it had passed completely into the ring; and in three weeks the cure was complete without any remaining trace of swelling.*

RICHTER followed the same plan with an equally favourable result in an inguinal hernia, which had existed ten years. He operated on the fifth day of strangulation; and found the intestine adhering strongly to the back and neck of the hernial sac. He separated it below, leaving the rest of the adhesion untouched. On the tenth day the intestine had been considerably withdrawn, so that only an inch of it remained out of the ring. On the twentieth day no portion of the bowel could be seen in the wound.†

In the following case, the plan of leaving a portion of adherent intestine was pursued with favourable result by Mr. LIZARS, of Edinburgh. JANET SUTHERLAND, aged thirty-five, was admitted Nov. 5, 1830. She had been in the infirmary six weeks previously with a crural hernia of the left side, which had been down for eight days, and was accompanied with tenderness of the abdomen, but no pain in the swelling, obstinate constipation, nausea, vomiting, and acceleration of the pulse. It was then ascertained that a portion of the tumour had been down for more than a year. She was relieved, and went home with the swelling diminished, but not removed: she states, however, that one day it went up entirely. Nine days before the present admission the tumour again increased beyond its former bulk, the bowels having been confined, and there has been no stool since that time, but frequent vomiting of green matter. The abdomen is distended, and painful on pressure; the tumour tense, but not painful; the tongue furred, the pulse small and wiry. She was placed in the warm-bath: when the tumour was grasped with the hand, the contents of the intestine went back with a gurgling noise, and the rupture was reduced to its former size. The costiveness and vomiting continued, the abdominal tension

* *Sull' ernie*; Mem. ii. § 28.

† *LODER'S Journal*; vol. i. p. 19. The case is quoted at length by SCARPA, Mem. ii. § 28.

and tenderness increased, though the part itself was still free from pain. The operation was therefore performed on the 6th. The hernial sac adhered extensively to the protruded intestine, which was of a dark livid colour, about three inches in length; two small cysts containing a serous fluid were formed by these adhesions. GIMBERNAT's ligament was divided horizontally towards the pubes, but the intestine could not be emptied: this object, however, was accomplished when a portion of the neck of the sac in the contiguity of GIMBERNAT's ligament had been dissected off from the intestine. "The intestine and sac, in consequence of their extensive adhesions, could not be returned, and were consequently left in their position: they were covered by the integuments, which were brought together by stitches; a compress was applied together with a bandage, and the patient carried to bed. Half an hour after the operation, a purgative enema was administered, when the bowels were freely opened, an effect which could not be accomplished before. Twenty-four leeches were applied to the abdomen, and half an ounce of castor oil taken by the mouth. By the evening she had two motions from the castor oil, and expressed herself free from pain; the abdomen was flaccid, and not painful on pressure; the pulse full and soft, and the tongue moist. From the hour of the operation she had progressively recovered, and was discharged this day, January 6, 1831, cured. Upon an examination before her dismissal, there was no appearance of either the herniary sac or the intestine in the inguinal region, both having retired into the abdominal cavity, and thus admitting of the application of a rupture truss."*

Reduction may be prevented by adhesions at the mouth of the sac, which should be separated cautiously, as the parts are out of sight, and may therefore be wounded. It may be advisable to enlarge the incision both of the integuments and ring, and to draw the sides downwards, so as to bring the adhesions into view. The precaution of introducing the finger, to ascertain that the viscera are completely disengaged, and that the ring is free, which should not be neglected in any instance, is more particularly necessary in the cases now under consideration. If there should be firm, close, and extensive adhesion, either of the omentum or intestine to the mouth of the sac or in its immediate

* *London Med. Gazette*; vol. viii. p. 658.

neighbourhood, it would be best not to attempt the separation, but to be satisfied with taking care that the pressure of the stricture is completely removed.

In cases of what SCARPA calls natural fleshy adhesion, described in CHAP. IX. SECT. 6, where the cæcum and colon have passed through the ring connected behind and at the sides as in their natural situation, we must be contented to remove stricture, and to cover the parts by bringing together the integuments. If the peculiar nature of the rupture were ascertained or suspected beforehand, it would be advisable to operate without opening the sac.

In the second edition of his work, SCARPA has mentioned a case, illustrating the course that should be followed in the ruptures containing the cæcum or sigmoid flexure of the intestine.

“A strong man, thirty-six years of age, following the employment of chimney-sweep, was cured in the hospital of Turin of a scrotal hernia on the right side, which had existed from infancy, and had recently become strangulated. In addition to the ordinary causes of strangulation, the patient had received a kick from a mule on the right buttock. There were manifest symptoms of gangrene, which induced professor ROSSI to operate immediately. It was necessary to proceed very cautiously in opening the sac, on account of adhesions between it and the protruded parts. When it was opened, two livid and blackish convolutions of the ileum were found, and behind them was the cæcum and its appendix. In separating some of the adhesions, the latter, which was already gangrenous, gave way. A little blackish mucous liquid with a fecal smell escaped from the opening. The *natural adhesions* of the cæcum and commencement of the colon were left untouched, and the small intestine, which was free from adhesion, was replaced. There remained in the scrotum the cæcum with the relics of the appendix, and a portion of hardened omentum adhering to the sac. The whole was covered with a soft rag soaked in olive oil. When the dressing was removed on the third day, the cæcum and appendix appeared reddish, and a few days after they were covered with granulations. During this time the villous coat of the appendix became everted like a small fungus, and a little fluid fecal matter constantly escaped. Subsequently, under the use of mild topical applications, the wound gradually contracted and cicatrised. The torn margin of the appendix

closed at last under moderate pressure. An abscess, which formed in the bottom of the scrotum, protracted the cure to the end of the third month. The patient afterwards wore a truss with a hollow pad.”*

When the parts have been replaced, the finger should be gently introduced to ascertain that the ring is free, and that the viscera have completely re-entered the abdominal cavity. This precaution is necessary, not only where adhesions have existed, but because it is possible for the protruded parts to be returned still constricted by the neck of the sac; and because in other instances they have been thrust up between the peritoneum and muscles. Cases of the first kind are mentioned in CHAPTER XVI, SECT. 3, and are alluded to in CHAPTER IV, SECT. 1, on the subject of stricture by the neck of the sac. On the latter point I may cite a case of bubonocoele operated on by PELLETTAN, in which he had pushed the intestine beyond the ring; the patient had no stools, and soon died. The parts had been thrust between the peritoneum and the abdominal muscles; probably still constricted by the mouth of the sac, though this circumstance is not mentioned.†

In conclusion, let me again impress on the mind of the surgeon how important it is to the success of his efforts, and to the safety of the patient, that the object of the operation, the return of the protruded parts to their natural situation, should be accomplished with gentleness, that all unnecessary violence should be avoided. The necessary divisions of parts should be effected with the knife, since a clean-cut wound unites more speedily and excites less inflammation than one in which laceration or contusion has been inflicted. Adhesions should in general be separated by the knife. If there is not sufficient room for accomplishing any purpose easily, the incision should be enlarged. This is particularly important in reference to the replacement of intestine, which is so altered in many cases, that it will not bear considerable pressure. “I have more than once,” says Mr. WILMER,‡ “seen the intestine burst by the violence used

* F. BRACHI, *Diss. de hernia inguinali immobili*. Taurini, 1813: quoted in SCARPA *Sull' ernie*; ed. 2, p. 75: and in the *Supplement au traité pratique des hernies*, p. 21.

† *Clinique chirurgicale*, tom. iii. p. 335.

‡ *Practical Observations on Hernia*, p. 3. Sir C. BELL gives a representation of an intestine much injured by the forcible attempts to return it. *Elements of Operative Surgery*; pl. ix.

by the operator in returning it." ARNAUD* saw the intestine torn in an attempt to lacerate an adhesion. If distended intestine can be emptied by gentle pressure, its return will be facilitated; but, if this cannot be effected without violence, it will be right to enlarge the incision of the stricture.

The parts should be returned as speedily as possible: exposure to the air and handling are likely to excite inflammation in serous membranes, which, in their natural position, are never exposed to such influences.

An attention to the points now alluded to is calculated to favour the closure of the wound by adhesion, an event particularly desirable in all wounds penetrating circumscribed cavities, as it prevents the occurrence of inflammation.

The best mode of uniting the wound is by sutures, of which we should employ a number sufficient to bring the edges into apposition. It may then be covered with a folded cloth dipped out of cold water and frequently renewed. If we see reason to fear that the parts may protrude again, moderate pressure may be made on the neck of the sac by means of a compress secured by the spica bandage. In general this is not necessary; and it is desirable to dispense with it, as the pressure of the compress and bandage on the wound and abdomen sometimes causes uneasiness. Occasional pressure on the neck of the sac by the patient's own hand will in general do all that is required.

If the sac, when large or thick, should prevent the edges of the wound from coming together, or be likely to retard their union, a portion of its sides may be cut away; care being taken to avoid injuring the spermatic vessels or vas deferens. The sutures should not be carried through the sac.

To obviate the risk of renewed protrusion, the patient should avoid every exertion, in which the respiratory muscles are brought into strong action. He should be carried back to his bed, and lie quietly there. The administration of clysters and laxative medicines will prevent the necessity of straining for the expulsion of the feces.

A small and soft pillow should be placed under the scrotum.

* P. 317.

SECTION VI.—OPERATION ON INCOMPLETE INGUINAL
HERNIA.

When the viscera are strangulated in the inguinal canal, without having descended through the ring of the obliquus externus, the aponeurosis of the latter muscle must be divided, in order to expose the tumour. An incision beginning above or on the outside of the upper opening of the inguinal canal should be carried along the middle of the swelling in its long axis, and we should expose the tendon of the external oblique. A small opening must be made in the latter, to allow the introduction of a probe or director which will enable us to enlarge the cut sufficiently ; or the operator may divide the aponeurosis at once with the knife. The hernial protrusion will now be seen or felt, covered by the lower fibres of the obliquus internus and those of the cremaster. These muscular fibres must be divided so as to lay bare the sac, which is to be opened in the usual manner. The stricture, formed either by the lower margin of the transversus, or by the neck of the sac, will then be easily divided with the curved and blunt-ended hernia knife, directed either by the end of the fore-finger or by the deeply grooved curved steel director. The incision should be carried directly upwards, for the reasons already explained. As the parts are protruded, if not invariably, at least in the great majority of cases, on the outside of the epigastric vessels, so that these are found at the inner edge of the mouth of the sac, there would be little if any danger in cutting upwards and inwards. Two instances, however, in which the epigastric artery has been found on the outer side of the mouth of the sac, in incomplete inguinal hernia, are mentioned in CHAPTER IX. SECT. 4.

Cases of strangulated incomplete external inguinal hernia in the male, in which an operation was performed, are mentioned in CHAPTER IX. SECT. 3.

A rupture of the same kind in the female, which had become strangulated, was operated on in the London Hospital. The patient, fifty years of age, had been the subject of hernia for fourteen or fifteen years. It had descended on the day of her admission, when a small firm tumour was perceptible to the touch, but not to the eye, in the situation of the right canal. As it could not be returned, and the

symptoms were urgent, the operation was performed. It was necessary to divide the aponeurosis of the obliquus externus in order to expose the sac, which contained a portion of ileum, strangulated in the canal, and tightly embraced by the upper opening of the abdominal ring. She left the hospital well on the tenth day.*

SECTION VII.—OPERATION ON LARGE HERNIÆ ; ON BUBONOCELE COMPLICATED WITH HYDROCELE ; IN PREGNANCY. PROCEEDINGS DESIGNED TO PROMOTE THE RADICAL CURE.

Large herniæ.—In the fourth section of the present chapter I have mentioned reasons, why the ordinary operation is not applicable to such cases ; and why it would be preferable, either to remove the stricture without opening the tumour, or to divide only the neck and mouth of the sac.

Complication with hydrocele.—The relative position of the hernial tumour and the hydrocele, where the two complaints exist together, has been described in the second section of CHAPTER X.

If we should operate when the hydrocele merely advances in front of the lower part of the rupture, it will be sufficient to limit the external incision and the division of the sac, so as not to interfere with the tunica vaginalis ; and it will be proper to observe this precaution whenever the circumstances will admit. But if, as in the instances mentioned in that section, the hydrocele should cover nearly the whole anterior surface of the sac, it might be necessary, in operating, to cut through the former. To avoid embarrassment, the surgeon should carefully ascertain the exact state of things before he begins.

Operation during pregnancy.—Utero-gestation constitutes no objection to this operation. The measure is resorted to for the purpose of saving life, and is therefore equally necessary in pregnancy as in other states. This condition does not seem to increase the danger of the operation. Cases in illustration of this point are mentioned in CHAPTER XVII.

* *London Medical Gazette*, vol. viii. p. 767.

On umbilical ruptures ; and in CHAPTER XII, SECTION 5, on artificial anus.

Radical cure.—It has been proposed to combine with the operation for strangulated hernia certain proceedings considered likely to promote the radical cure of the complaint. The notion seems to have been entertained that if the mouth of the sac could be closed, and kept in that state, that the rupture would not be reproduced : hence a ligature has been placed on the mouth of the sac ; and the sac itself has been dissected away. The combination of these processes was successful in two instances of irreducible but not incarcerated ruptures, operated on by SCHMUCKER.* The latter completely failed in the hands of Sir A. COOPER.† After the operation had been performed in a case of strangulated femoral hernia, he carefully dissected away the sac, and then brought the parts together by sutures. They healed readily ; but, in a month, the hernia had returned to its original size.

The ligature, when employed by PETIT, produced symptoms so alarming that its removal was thought proper ; after which they ceased.

In a case of strangulated hernia, which he could not return, he says, “ I opened the tumour, and replaced the omentum ; I then detached the sac and tied it, as I had seen done, and dressed my patient. In two hours time I was much surprised at receiving a message that she felt great pain over the whole belly, and severe gripings. I hastened to the patient, fancying that the intestine might have slipped into the ring and become strangulated ; but, when the dressings were taken off, and nothing was found in the wound, I concluded that the mischief had been caused by tying the sac. I cut the ligature, and removed it, and dressed the parts simply : the symptoms were immediately relieved, and ceased entirely in an hour. This is not the only observation I have made on the subject : all I have seen has confirmed me in the opinion, that the ligature of the sac, or in other terms, of the peritoneum, since the sac is formed by that membrane, may bring on symptoms very like those caused by strangulation of the intestine : I cannot doubt that those, whom I have seen perish after the em-

* These cases have been already cited in the fourth chapter, on the radical cure of ruptures. See *ante*, p. 116.

† Part i. edit. 2, p. 61.

ployment of the punctum aureum, have died from inflammation of the belly caused by tying the sac.”*

We may expect that the application of a ligature to the hernial sac will excite inflammation of its internal surface; and that the inflammation thus caused will be propagated by the continuity of surface to the abdomen generally. Hence the proceeding now alluded to must be considered as one attended with great danger.

The proposal of RICHTER, to scarify the neck of the sac, in order to produce adhesion of its sides, and thus to close the orifice, has been already noticed.† He states that he has found this successful in practice, and therefore recommends it. If it be carefully performed, it must be nearly or entirely free from risk; although I do not see how it could either accomplish or contribute to the obliteration of the mouth of the sac.

I cannot believe that any one of the methods now under consideration is calculated to attain the proposed object. Why does the rupture return after the operation? because the ring has been enlarged by the previous protrusion, and is still further weakened by the incision necessary for removing the stricture. This state of the tendinous openings would not be altered by closing the mouth of the sac, even if we could accomplish that object. We must reject the ligature on account of the danger inseparable from its employment; and we have no sufficient reason for placing confidence in scarification of the sac or in its removal by dissection. In many instances these latter methods would be neither easy nor free from danger. Hence we account for the circumstance that all these various methods have become completely obsolete.

SECTION VIII.—TREATMENT AFTER THE OPERATION.

The management of the wound is a very simple affair. The best external application is a soft folded rag, dipped

* *Traité des Mal. Chirurg.* tom. ii. p. 339.

† See *ante*, p. 291.

out of cold or tepid water, and renewed whenever the patient may find it agreeable. The sutures should be cut out at the end of forty-eight, or of twenty-four hours. Union by adhesion will take place within the latter period, if it is to be effected at all; and, after the edges of the wound have become agglutinated, the sutures can no longer be of use. I have often seen the wound made in the operation for strangulated hernia, when thus managed, unite entirely by adhesion, without requiring anything that could be called dressing; a result, which will not, I think, be obtained, if adhesive plasters, pledgits, compress, and bandage, be employed according to the rules of art.

In some parts of Europe the mode of dressing is still continued, which was employed before the union of wounds by adhesion was well understood: that is, the cavity of the sac and the wound generally are filled with lint or linen spread with cerate, and with charpie, and the whole is covered with compress and bandage. If the object were to produce inflammation, I could not point out a better means of accomplishing it. Let it be remembered that this inflammation, involving the hernial sac, will probably extend to the abdomen, especially if we should follow the advice sometimes given, of introducing the dressings into the very mouth of the sac.

If the wound should inflame or suppurate, a poultice or simple dressing may be required.

A truss should be applied as soon as the cicatrix has acquired sufficient firmness to bear the pressure; and it should be worn constantly afterwards. The operation removes the immediate danger connected with the strangulation, leaving the patient liable to a renewal of the protrusion, which may be expected to take place even to a greater extent than before, unless it be prevented by the use of the truss. Sometimes a radical cure is effected: but, as this cannot be ascertained at first, it is right to adopt the precautionary measure in every instance.

When the operation is finished, the patient should be placed in bed, and allowed to remain there quietly for some time, a little tea, thin gruel or other diluent being given if it is desired. The pain is lessened, and the vomiting ceases, after the operation: sometimes the bowels are spontaneously relieved, and a considerable abatement of the symptoms in general ensues. More commonly it is necessary to solicit the action of the intestinal canal by aperients and injections.

If, therefore, the bowels should not have been relieved in three or four hours, a few grains of calomel may be given, in a pill; or two pills may be administered consisting of calomel and the compound extract of colocynth in equal parts. The sulphate of magnesia may be given afterwards in the dose of two drams or of one dram, in the infusion of roses, or in a mixture of mint water and common water; and this should be repeated every three or four hours until the bowels are freely relieved. If this desirable result should not occur after the second dose, a large common injection should be thrown up, with the addition of four or six ounces of infusion of senna or an ounce of castor oil.

We must repeat those or similar means, and persist in their employment, until the canal is completely unloaded; remembering that the intestines frequently contain a large collection of fecal matter and of morbid secretions, which can only be got rid of by several copious motions, and that the operation of purgatives must be salutary, not merely by removing this noxious accumulation, but by exciting a discharge of fluids calculated to lessen inflammatory action. The notion that purgatives are capable of exciting the mucous membrane of the alimentary passages, and thus of producing or aggravating inflammation of the stomach and bowels, and the prohibition of their employment on this account, both after the operation for strangulated hernia and in many other cases, is in my opinion entirely groundless; and the practical precepts founded on this theoretical and imaginary foundation have always appeared to me a signal triumph of doctrine over the most unequivocal results of experience, and the plainest dictates of common sense.*

Until the bowels have been unloaded, and all risk of inflammation has passed by, the patient should be confined to liquids, such as toast-water, barley-water, tea, thin gruel: a light and sparing diet should be enjoined until recovery is complete. The stomach and intestines continue irritable

* In those schools, where the doctrines above alluded to have prevailed, some persons, as we might expect, have protested against them. M. VELPEAU recommends the exhibition of purgatives after the operation, and dissents expressly from the opinion of DUPUYTREN and others that these remedies increase the probability of inflammation. He adds, " J'ai vu à l'hôpital de Tours M. GOURAND opérer un assez grand nombre de hernies: on administrait à tous ses malades une potion presque immédiatement après, et nulle part, que je sache, on n'a observé une plus grande proportion de succès. M. BOYER, qui paraît être dans la même habitude, passe aussi pour être fort heureux dans ces sortes d'opérations." *Nouveaux Elémens de méd. opérat.* tom. ii. p. 400.

for some time, so that any deviation from this rule brings on disorder, and impedes the progress towards recovery. Many cases have ended fatally, and great danger has arisen in others, from neglect and imprudence in this respect.

Peritonitis consequent on the operation.—This is the most formidable affection that we have to encounter after the operation. In many cases the membrane is inflamed, or on the point of becoming so, before we operate, and the wound, with the exposure and handling of the sac and its contents, is sufficient to bring on peritonitis. After an interval of comparative ease, following the operation, pain in the part returns or increases, and feverishness comes on. More or less considerable uneasiness is felt in the neighbourhood of the ring, and extends over the belly, which becomes tense; the pain is aggravated by pressure, coughing, or drawing the breath; respiration is carried on without the aid of the abdominal muscles. The pulse, which had been small and depressed, becomes fuller and stronger; the skin is hot, the mouth dry, and the tongue marked by a dry, brownish streak in its middle. To these symptoms are added restlessness, constipation, and perhaps vomiting. In combating the peritoneal inflammation, which is thus obviously indicated, we must rely chiefly on the abstraction of blood, drawing it freely from the arm in the first instance, unless particular circumstances should render this measure unadvisable, repeating general depletion if the symptoms do not give way, and afterwards taking blood locally by leeches. The latter method, if employed effectively, that is, by the application of two, three, or four dozen of leeches, is often more effectual than venesection in checking peritonitis; and it may generally be resorted to with advantage, after one bleeding. Where the symptoms are less urgent, leeching alone will be sufficient.

Warm fomentations of the abdomen are agreeable to the patient, and give ease, if they do not assist materially in subduing the inflammation. If large flannels are used, being well wrung out of hot water and frequently renewed, they excite the capillary circulation and produce a copious exhalation, not only from the belly, but from the surface generally, with great relief to the circulation.

Aperient medicines and clysters are employed after depletion, or in conjunction with it.

If the symptoms of peritonitis should not yield to these measures, we resort to the use of mercury, giving it so as

to affect the system. No form of the remedy is better suited to our purpose than calomel combined with opium. Two or three grains of the former, with one-third of a grain or half a grain of the latter, may be given every four, six, or eight hours. Under this treatment, the symptoms, which have continued in spite of depletion, often give way rapidly and satisfactorily.

A blister to the abdomen is often serviceable when it continues painful, and we are unwilling to repeat depletion. It may be advantageously combined with the administration of mercury.

Sometimes inflammatory symptoms characterise the strangulation from the beginning, and lead us to operate early. Inflammation of the abdomen exists at the time, and continues after the operation. Active antiphlogistic treatment is necessary. The use of aperients is not to be neglected: they will produce copious evacuations, although we cannot suppose that there is much fecal accumulation. Our efforts in such cases are sometimes ineffectual; the inflammatory disorder proceeds unchecked, and its nature is clearly evinced, in examinations after death, by depositions of lymph on the abdominal parietes and contents, and sero-purulent effusion into the cavity.*

The means employed to subdue inflammation may render the patient so weak as to require that his strength should be supported by nourishing food and by stimuli and cordials in the shape of diet and medicine.

Irritability of the stomach and sickness may often be quieted by the effervescing saline draught with opium, or by calomel and opium: and the latter medicine with cordials is the best remedy for diarrhœa, if it should come on in the course of the cure.

Changes in the intestine after its return.—When intestine, of which the coats have been thickened and discoloured, is replaced in the abdomen, it frequently recovers, and performs again its natural office: sometimes it continues in a morbid state, becomes still darker, and does not resume its functions, but on the contrary, acts as an irritant on the surrounding parts, and excites inflammation, which terminates fatally. The disorder of the intestine

* Cases of this kind are detailed by PELLETAN, *Clinique chirurgicale*; tom. iii.; p. 55; p. 364—375: and by TRAVERS, *Inquiry into the process of nature*, &c. p. 222—232.

may even proceed to mortification after its return: the separation of the slough allows the escape of intestinal contents, which may either be poured out into the cavity of the abdomen with a speedily fatal termination; or may form a limited effusion, circumscribed by adhesions, and exciting inflammation and suppuration, which makes its way externally; or may find their way either wholly or in part through the wound. It sometimes happens, in the latter case, that they resume their natural course, after a longer or shorter period; and the patient recovers. We conclude that, in such cases, the continuity of the tube is restored, after the separation of the slough, by adhesion of the affected bowel to the neighbouring parts.

The fifty-ninth observation of LE DRAN* is a case, in which the intestine gave way on the eleventh day after its replacement in the abdomen. The feces came through the wound, and the patient recovered.

In a dissertation by MALAVAL on the question "*an tenuium intestinorum vulnus lethale*,"† two cases are related, in which feces came through the wound some days after the operation; both the patients recovered.

PELLETAN operated on a man for crural hernia on the seventh day. The intestine was returned; every thing went on well, and the wound was closing, when fecal matter in small quantity was observed in it. By the use of purgatives, clysters, and strict diet, this ceased, and the parts healed. Soon after, from over-eating, a swelling took place near the cicatrix, inflamed and burst, and gave issue to feces and pus. By careful management he recovered again.‡

Sir A. COOPER mentions a case of bubonocoele, operated on by Mr. TURNER, of Yarmouth, in which a large part of the omentum and a small portion of intestine were found in the hernial sac. A part of the omentum was removed, and a ligature passed through the remainder was loosely tied, both the intestine and omentum being placed at the mouth of the sac: the edges of the wound were brought together. The symptoms of strangulation ceased, and there were regular stools for nine days; on the tenth, feces were discharged at the wound, though a part still passed

* *Observations in Surgery*; p. 200.

† In HALLER, *Disp. chir.* tom. v. p. 77.

‡ *Clinique chirurgicale*; tom. iii. p. 65.

by their natural channel. For eleven weeks they came partly by the wound, which then healed.*

In another case of inguinal entero-epiplocele, Sir A. COOPER returned the intestine, although it was much changed in colour. The bowels acted soon after the operation, and the case went on well for three days, when peritonitis took place. On the fifteenth day after the operation, feces passed from the wound. This feculent discharge, having continued for a fortnight, began to diminish, and had wholly ceased in three weeks, when the wound closed.†

In a third case of strangulated inguinal hernia, Sir ASTLEY returned the intestine, which was dark but not gangrenous. In five days after the operation feces were seen in the wound, and continued to pass for three days, when they resumed their natural course. The patient became convalescent, but was attacked with erysipelas just as the wound was cicatrised, and sunk in a few days. "The body was inspected by Mr. KEY. The portion of intestine strangulated was the ileum, about eighteen inches from the colon: it had contracted a firm adhesion to the upper and outer side of the mouth of the sac, and by this adhesion the breach in the intestine had been repaired; for on slitting up the intestine, the aperture, through which the feces had passed, could be distinctly traced, the breach in the gut being filled by the peritoneal lining of the parietes, which had contracted adhesion to the gut, and was but little changed in appearance."‡

In operating on a strangulated congenital hernia, Mr. KEY returned the intestine, which was very dark, but still retained its lustre. A copious discharge of feces took place from the wound on the fourth day, and continued for some days, after which the parts healed and the patient recovered.§

CASE.—A woman about sixty years of age, was brought to the hospital for a bubonocoele, which had been strangulated two days. The urgent nature of the symptoms induced Mr. RAMSDEN to operate in about two hours after her admission. The escape of a large quantity of turbid and fetid fluid, when an opening was made in the sac, led Mr. R. to fear that he had injured the intestine, but the sub-

* *Part i.* ed. 2, p. 47.

† *Ibid.*

‡ *Ibid.*

§ *Memoir*; p. 112.

sequent complete exposure of the part proved this apprehension to have been groundless. The gut, which was much discoloured, was returned without difficulty, but seemed not to have completely re-entered the abdominal cavity. On passing the finger as high as the incision would admit, it did not fairly reach the abdomen; it seemed as if the intestine, although free from stricture, were contained in a peculiar membranous bag. The patient was found in the evening, with great pain in the belly, an exceedingly quick and weak pulse, and cold sweats over the whole body. Clysters, which had been ordered for her, could not be forced up. After a long examination with candles, &c., some hardened feces were brought away from the rectum; but the low and faint state of the patient had now so greatly increased, that little hope remained of her surviving even a few hours. On the next morning, to the great surprise of her attendants, she had considerably recovered; her pulse was about eighty, and moderately full; but as no stools had yet been procured, pills of the cathartic extract and calomel were given every two hours. She began to be purged in the evening, and had eight or ten stools before the next morning. Her strength again failed: the pulse could scarcely be felt, and the body was covered with a cold sweat. By the liberal use of strong broth, sago, and wine, she was so far restored in a few days as to sit up in bed. Her appetite returned, and well-grounded hopes of her recovery were entertained.

For some time after this she exhibited alternately the opposite symptoms above-mentioned, according to the state of the intestinal functions. She was seized, in about six weeks after the operation, with violent pain in the lower part of the abdomen, which terminated in two days in a discharge of the feces through the wound, and perfect ease. The appetite now failed, the strength decreased, and death took place on the tenth day from the appearance of the feces in the wound.

On examining the body, the whole of the intestines were found so strongly adherent to each other, that they could not be separated without laceration. A portion of the ileum, the same probably which had been protruded, adhered to the abdominal ring. Its coats were greatly thickened, and its canal was much contracted. A small ulcerated aperture was discovered in this part; and led, in a fistu-

lous form, through a substance nearly equal in size to the little finger, to the external wound.

Inflammation and suppuration of the hernial sac.—Among the consequences of the operation Mr. KEY mentions one as having been hardly noticed in the writings of surgeons. He says, “The circumstance I allude to is suppurative inflammation of the hernial sac. The symptoms attending it are so severe in their character, and so much resemble those attending strangulation of the gut or omentum, that the danger of confounding the two states is alone sufficient to arrest attention. In ordinary cases of operation for strangulated scrotal hernia, where every thing goes on well, the scrotum remains tender, and a slight purulent discharge continues till the whole surface has either adhered or granulated; the sickness and constipation cease, the hiccup is speedily abated, and the symptoms of general depression soon subside. In some cases, on the contrary, the scrotum becomes tumid and painful in a day or two after the operation, the hiccup and vomiting recur, the bowels become torpid in their action, or entirely obstructed, and the surgeon is led to believe that the intestine has returned through the abdominal ring into the sac; this idea is strengthened by the feeling of the patient, who describes the sac as being full, and giving him the same sensation as when his rupture was down. Impressed with this view of the case, the surgeon is naturally enough disposed to open the sac, with a view to return the prolapsed contents; an operation that in all probability would be fatal to the patient.” With the view of guarding against the mistake just alluded to, Mr. KEY observes, that a renewal of the descent after the intestine has been properly replaced, is of very rare occurrence. He gives the particulars of two cases, in which the sac inflamed and suppurated. In the first of these, six ounces of matter escaped on the thirteenth day; and a smaller collection was opened twelve days after. Five ounces of pus were discharged from the sac on the fifteenth day in the second case.*

Sloughing of the testis.—Dr. HULL† mentions an instance in which the testis and spermatic cord sloughed after the operation, although it was not known that the artery had been divided. From the variations in the course of the cord and of its component parts, we can understand that it

* COOPER, Part i. ed. 2, p. 58—60. Note by the Editor.

† *Medical and Physical Journal*, vol. xi.

might be divided wholly or partially without the operator being aware of the circumstance.

The symptoms of strangulation sometimes continue unaltered by the operation. The explanation of this circumstance will be found in CHAPTER VIII. SECTION 2.

The treatment to be pursued when the intestine has mortified will be considered in the next chapter.

CHAPTER XII.

Mortification of the Intestine in Ruptures, and its Treatment.

SECTION I.—GENERAL REMARKS.

MORTIFICATION of the intestine may occur in strangulated hernia as a consequence, either of violent inflammation, or of interruption and suspension of the circulation by the pressure of the stricture. The latter is the most frequent occurrence: enteritis arising from other causes seldom terminates in gangrene; and this effect is rarely seen as the result of inflammation in ruptures.

Violent inflammation and the pressure of stricture produce changes in the state of the bowel, especially alterations of colour, some of which resemble more or less nearly the appearances characterising mortification; and they cause considerable change in the part previously to the loss of vitality. There is a gradual transition, through successive alterations, from the normal state to that of mortification. It is a matter of considerable practical importance to distinguish between mortification and the alterations of appearance which may be mistaken for it; and to discern the point of time, when mortification is either inevitable or has actually occurred. To return a dead portion of intestine into the abdomen would be dangerous, perhaps fatal; while it would be equally injurious to the patient to treat intestine, which is simply discoloured, as if it had mortified.

The length of time that the strangulation has lasted gives us little assistance in judging whether mortification has occurred. When it is the consequence of high inflammation, this change comes on rapidly; in forty-eight or twenty-four hours, or a still shorter period. Such instances have been already quoted in CHAPTER IV. SECTION 2: they are

examples of acute strangulation, coming on suddenly from external causes in robust individuals of full habit. In such persons a close constriction of the bowel, independently of active inflammation, will produce the same effect. In other cases, especially of less excitable patients, the pressure on the bowel does not produce inflammation: it impedes the circulation in the part, the obstacle increases slowly, and at last the blood stagnates. The circulation is suspended, and loss of vitality ensues. This event does not occur in some cases till the tenth or twelfth day, or even a later period.

Mortification of the intestine is most likely to occur in small ruptures coming through narrow openings, where the pressure must be considerable; in herniæ, which contain intestine only; and in persons of full habit and irritable constitution. The pressure in large ruptures is less considerable, and is spread over a more extensive surface: the presence of omentum protects the intestine.

The aponeurotic openings are less firm in young subjects, and exert a less effective pressure. Hence mortification rarely happens in a hernia before puberty.

Local changes.—The alterations in the intestine, more particularly in its colour, which are caused by the pressure of the stricture, and do not proceed to loss of vitality in the parts, have been already considered in the fifth section of the preceding chapter, where the distinction has been pointed out between such changes and those which constitute mortification.

Mortification of the intestine.—M. JOBERT has made numerous experiments on animals to illustrate the progress and character of this change. His description of what he has thus observed in the dog corresponds nearly to the appearances met with in the human subject. He distinguishes two periods: 1st, mortification; 2ndly, detachment and decomposition.

“ In the first period, the mortified portion is dull, yellowish, or slate coloured, and free from smell. It does not preserve its form, but collapses like a faded leaf. In its colour, dryness, collapsed state, low temperature, insensibility and insusceptibility of contraction, it presents a striking contrast to the sound part of the intestine. The immediately neighbouring portions of the canal are preternaturally red, painful, and easily excited to contraction. When the constriction has been sudden and violent, the intestine is

never black : the blood, of which the vessels do not contain a large quantity, is either effused into the canal, or coagulates in the small vessels, producing a mixture of blue and dead white.

“ In the second period, which succeeds more or less rapidly to the first, the colour of the intestine, which approached to brown at the moment of strangulation, from the presence of venous blood in the vessels, has completely disappeared ; for the blood has been exhaled in the interior. The mortified portion is dull, greyish, or ash-coloured, and presents whitish portions, intermixed with small brown lines. It has a very disagreeable smell, more offensive than that which attends external mortifications. The cohesion of the particles is so much impaired that the bowel may be torn like wetted paper. The mucous membrane is converted into a kind of pulp ; then the muscular, and lastly the serous tunic.”*

“ In a dog, I tied a convolution of small intestine tightly with a waxed thread ; acute pain was experienced on drawing the ligature. The included portion of intestine became immediately tense, hard, and of a light violet tint, with irregularly scattered scarlet points. The animal made frequent efforts to void feces ; but vomiting did not occur till three hours afterwards. He was killed at the end of five hours. The intestine, which had been included in the ligature, did not contract under the application of stimuli. It no longer presented the violet colour, observed at the moment of strangulation, but was marbled. It was soft and flaccid. The serous membrane was dry and dull ; there was nothing remarkable in the muscular coat ; the mucous membrane was red, dotted, and softened. There was a small quantity of black blood in the tube.

“ A portion of intestine was tied in another dog more tightly than in the former instance : the same symptoms were produced. The animal was killed on the following day, when the mortified portion was found detached ; the ends of the bowel were reddish, granular, and loosely surrounded by a kind of pouch formed of adventitious membranes. The mortified portion was white, and had a putrid odour ; a process of softening was going on from the circumference towards the centre. The white colour was owing to the small quantity of blood in the part. All tissues

* *Traité des mal. chirurg. du canal intest.* tom. ii. p. 27—29.

would be white under mortification, if they were not coloured by blood."

"In another dog a portion of intestine was tied, and the ends of the ligature were left in the wound, so as to allow the tied portion to be drawn out at pleasure. At the moment of tying, the portion of bowel was swelled and violet coloured; the animal suffered acute pain. Some time after, the part was almost white, indicating exhalation of the blood into the tube: stimuli produced no effect on it; it was insensible, flaccid and dull. All the tissues had become opaque, and the appearance could not be better described than by the epithet *dead white*. The neighbouring portion of intestine was of an uniform red, with the arterial pulsations strongly marked, and it was very sensible to the touch. When the animal was opened the next day, the tied portion was flaccid, with an offensive odour, indicating putrid decomposition, and covered by adventitious membranes. It presented several perforations, through which the intestinal contents flowed on gentle pressure. The mucous membrane was softened and destroyed; the muscular coat was reduced to a pulp; while the serous covering still presented a degree of firmness at some points."

From his various experiments on animals, M. JOBERT concludes, "that the pain caused by intense strangulation is violent at the moment, but passes off: that vomiting comes on later, in proportion as the strangulation is more violent, such constriction probably suspending the peristaltic movement: that it is repeated more frequently, in proportion as the quantity of liquids and aliment in the stomach and intestines is more considerable. That two periods, more or less near to each other, may be distinguished in gangrene: in the first, the mortified part is flaccid, of a dull straw colour, insensible, without heat or power of motion; in the second, the slough is detached, softened, and has an offensive odour: and that the serous membrane preserves its firmness longer than the other tunics."*

The extent, to which the intestine in strangulated hernia may be affected with mortification, varies from a small spot to a more or less considerable portion of the entire canal.

From the unequal bearing of the stricture, one portion may escape while another is mortified in the same part of the canal. Mortification is most likely to occur in the

* *Ibid.* p. 39—44.

part embraced by the stricture. The latter forms an effectual boundary to the mischief, which I do not remember to have seen extending beyond that point. It seems, however, not improbable that inflammation, excited by the stricture, might extend along the intestine within the abdomen, and lead to mortification in this situation.

State of the swelling.—The intestine is sometimes found gangrenous, when no appearance had been noticed previously to the operation which could have led us to suspect the occurrence of such a change. The integuments and hernial sac are healthy in such a case. In other instances, the mortification of the hernial contents affects the superincumbent parts, and the integuments lose their vitality. The swelling becomes inflamed, and extremely tender; the integuments assume a deep red tint, and then turn bluish or greenish, livid or black: the swelling loses its tension and is soft, so that it pits on pressure; the cellular membrane becomes emphysematous; the cuticle vesicates and gives way, a thin purulent or ichorous discharge, of offensive odour, mixed with bubbles of air and perhaps fecal matter, issuing through the openings in a black eschar. The fecal matter may be infiltrated in the surrounding texture, and cause sloughings of the integuments beyond the limits of the tumour.

Inflammation of the hernial coverings attendant on changes in the protruded parts is always a serious symptom. The appearances, however slight, indicate more considerable change in the important parts within. Such a degree of inflammation, as causes thickening and hardening of the adipous texture, and obscures the outline of the swelling, attended as it usually is with great tenderness, indicates high inflammation of the hernial contents, and points out an urgent necessity for the operation. If the inflammatory change should have proceeded further, so that the integuments are red, and more especially if they should be deep red or livid, we may be sure that mortification has occurred within.

The extension of mischief from the intestine to the surrounding parts occurs in cases where the mortification arises from high inflammation: it may therefore take place soon after the strangulation. I operated on a female for femoral hernia, in twenty-four hours from the commencement of the symptoms. The tumour, which was extremely painful, had a firm feel like that of a phlegmon. The adipous

membrane was condensed and hardened by inflammation. The sac contained a knuckle of intestine, in the highest state of congestion and tension; and there was in its cavity a small quantity of thick reddish pus of offensive fecal odour.

The coverings of the hernia are not affected when the gangrenous change depends on the impediment to the circulation caused by stricture, and especially when that impediment is slowly produced and augmented. Many days will elapse, under such circumstances, before the vitality of the part is extinguished. At last, however, the coverings become affected even in such a case; more particularly if the mortified part gives way and the intestinal contents escape.

The presence or absence of fetor when the sac is opened does not afford conclusive proof either that mortification has occurred or that it has not. Mortification, in its first period, is not attended with offensive smell, while this circumstance may exist without loss of vitality. In a case already related, (see *ante* p. 327,) the sac contained a turbid and fetid fluid, although the intestine was sound. In the case alluded to in the last paragraph but one, the pus contained in the sac had so strong an offensive smell, that a gentleman present concluded the intestine must have been opened: that, however, was not only entire, but more tense than I ever remember to have found the bowel; it was indeed quite hard to the feel. When the stricture had been incised, the contents of the intestine were pressed up, and it became flaccid. It was returned into the abdomen, and resumed its functions. The patient recovered. A similar fetor is sometimes noticed in the contents of abscesses in particular situations, as near the anus, the male urethra, and the entrance of the vagina. Fetor is of no value as a diagnostic sign in the second period of gangrene, since the nature of the occurrence is demonstrated unequivocally by the other changes in the condition of the bowel.

General symptoms.—The intestine may mortify, not only without characteristic change in the hernial tumour, but also without any appreciable alteration in the general symptoms; and we may not know what has happened until the bowel is laid bare in the operation or in examination after death. “Mortification,” says M. JOBERT, “is indicated in most cases by the symptoms; but I must not forget to observe that it often occurs without obvious signs. Among several

facts, I may cite the case of a woman with mortified umbilical hernia, where, from the absence of marked symptoms, the nature of the case was not recognised. A large opening was made under the belief that it was an abscess. The error was soon discovered, and great indeed was my surprise and that of the other surgeon when we saw the omentum and intestine struck with death.”*

In other cases, there is a marked alteration in the general symptoms, on the occurrence of mortification. When the changes already described occur in the swelling, or in conjunction with a diminution in its size and tension, the pain ceases, the general disturbance is lessened, the circulation becomes more tranquil, the countenance is less anxious; the hiccup and sickness are relieved. The patient fancies that he is recovering, and the surgeon is sometimes deceived. This apparent improvement is but of short duration, being succeeded by depression or rather prostration of the vital powers. The hiccup returns; the countenance changes and becomes contracted; the pulse sinks, becomes small and irregular; the skin is covered with a cold sweat, and the extremities lose their temperature; the breathing is feeble; and the mental powers sink.

The local changes attendant on mortification sometimes lessen the obstacle to a return of the parts; the surgeon must be careful not to push them up, as this would only increase the patient's danger. The contents of the swelling sometimes recede spontaneously, and fetid stools are passed. Whether this occurs or not, the powers of life generally give way, and the patient sinks.

When the stricture is very tight the gut sometimes gives way at the point of contraction, and the intestinal contents escape into the abdomen. A sudden and overwhelming pain, with enlargement of the abdomen, marks this occurrence, which is rapidly fatal.

If the patient should not have been previously exhausted, the discharge of wind and feces through the perforations of the mortified intestine and integuments affords relief. The canal may thus be unloaded, the stricture being removed by the hand of nature. The powers of the constitution sometimes support the patient through this dangerous state, and lead to a partial cure, in which the feces are expelled through an opening in the groin, or occasional fecal or fluid discharge issues through a fistulous aperture; they may even

* *Lib. cit.* p. 51.

effect a complete recovery. Though the numerous instances of this kind, which occur in the records of surgery, should lead us to persevere in the use of such means, as may be likely to aid the salutary operations of nature, they ought not to raise sanguine hopes of similar results generally, nor lead us to give any other prognostic than such as would prepare the friends of the patient for the fatal termination.

Morbid changes in the abdomen.—The state of the abdominal cavity, in patients who die with mortified hernia, is the same as I have described in speaking of strangulation. Great distention and vehement inflammation of the intestinal canal above the stricture, extension of inflammation in a greater or less degree to the peritoneum generally, attended with partial effusions of coagulated lymph, and of sero-purulent fluid, and with more or less agglutination of the opposed membranous surfaces, constitute the chief features of the morbid change. The mortified gut is the centre, from which the inflammation extends; this part almost invariably adheres to the parietes of the cavity, and to the surrounding viscera, as well as to the hernial sac: and coagulating lymph is poured out most copiously in this quarter. The part of the canal, between the stomach and the intercepted portion, suffers principally: the distention and inflammation are here at the highest pitch; we see it stretched to three or four times its natural dimensions, and filled with air and liquids. A few of these enormous folds present themselves on exposing the cavity, and hide the remainder of the bowels, which are contracted, and comparatively free from disorder. The peritoneal sac, too, often participates only in a slight degree.

The disorder within the cavity is not always so great; and in some instances it is confined nearly to the protruded viscus. On these differences the events of particular cases must depend in great measure.

Prognosis.—This is always serious in herniæ, which have been attacked with mortification; but the foregoing observations, and the statements which will follow, show that it is not absolutely unfavourable; and that recovery after the intestine has mortified is not an unfrequent occurrence.

Rupture of the mortified intestine within the abdomen, with effusion of its contents into the cavity is a mortal occurrence. If the effusion should be limited by adhesions, and should find its way externally through the wound, the patient may recover.

Mortification from intense inflammation, where the symptoms are violent and pursue a rapid course, is much more dangerous than that which arises from obstruction to the circulation by strangulation, in which the symptoms come on more slowly, and are less alarming.

The result may be expected to differ according to differences in the age, constitution, habits, and previous health of the individual; as well as in proportion to the extent of the morbid change, and the general violence of the symptoms. The more extensive the gangrene, the more unfavourable will be our opinion of the case: hence mortification of the entire diameter is more dangerous than a partial loss of vitality. In the former case, the symptoms are more serious, and the restoration is accomplished with more difficulty. If a small spot only has mortified, the patient stands a better chance. The intestine, when returned, becomes adherent to the surrounding parts; and the mortified spot may be separated internally, so that the contents of the bowel never appear at the wound.

When the cæcum with its appendix has been protruded, the mortification of these parts has affected the natural course of the feces but little; and a perfect cure has rapidly taken place.* The process employed by nature in such a case, as also when a small opening has occurred in any other part of the large intestine, is simple and obvious. The opposed peritoneal surfaces of the gut and sac become united by adhesions: as the wound granulates, the opening gradually contracts, and thus diminishes the efflux of intestinal contents, while no obstacle exists to their passage in the natural course. The completion of the cicatrix makes the tube again entire.

The danger from mortification is greater in some ruptures, than in others: it is perhaps greatest in the exomphalos, from the situation of the opening in the centre of the abdomen, from its vicinity to the stomach, and from the obstacles which exist in this quarter to the establishment of an artificial anus. The chances are much better in inguinal and crural ruptures.

The prospect of recovery is greater, both in mortification and in wounds of the large, than of the small intestine. This difference was clearly understood by the older obser-

* *Edinburgh Medical Essays*; vol. v. art. xxxiv. *London Medical Observations and Inquiries*; vol. iii. art. vii. *HEY'S Practical Obs.*; p. 162. *Edinburgh Medical and Surg. Journal*; vol. ii. p. 313.

vers, who pronounced wounds and mortification of the small intestine to be absolutely fatal, while they only deemed those of the large highly dangerous. For this difference, which is fully established by the records of surgery, we can account in some degree by considering, that the contents of the large intestine are less disposed to pass through the wound, both because it bears a smaller proportion to the dimensions of the canal, and because they are less fluid. Further, that the absorption of the chyle is complete, when the seat of mischief is in the large intestine; but more or less imperfect, according as the wound is nearer to, or farther from the stomach in the small intestine. In the latter case, the patient has often perished from defective nutrition, which event cannot occur in the former. See the cases cited in a note at p. 349.

The probability of a favourable event is much greater in some kinds of rupture than in others. It has often happened, that the strangulation has included a part only of the diameter of the gut. In several cases of this description the feces have been partially discharged through the mortified opening: this quantity has diminished gradually as the wound healed, and the patient has completely recovered.*

When an intestine has had a part of its diameter thus protruded, the superior and inferior portions of the tube unite at the ring in a more or less acute angle. If we lay open the canal, a projecting ridge is observed on the inside, in the situation corresponding to the mesentery; and this is the obstacle to the passage of the intestinal contents from the upper into the lower portion of the gut.† SCARPA has imitated these protrusions on the dead body, and found, that when he inclosed two-thirds of the diameter, water injected into the superior portion passed with great difficulty, or not at all into the inferior, the angle towards the mesentery being acute, and the projecting ridge within the intestine preventing the communication of the two portions; where one-third only was constricted, the angle was in different instances more or less acute, and opposed

* Many such instances are related by Mr. LOUIS, in his "*Mémoire sur la cure des Hernies Intestinales avec Gangrène*," *Mémoires de l'Acad. de Chir.* tom. iii. See also *Lond. Med. Journal*, vol. x. p. 72.

† These circumstances are well represented in SCARPA's ninth plate, fig. ii. and iii.

more or less resistance to the passage of fluids through the constricted parts. *

In a hernia of this kind, the adhesive inflammation unites the peritoneum forming the neck of the sac to the sound portion of intestine; and the two ends of the latter, after the mortified part has separated, open into a membranous cavity, which before constituted a portion of the peritoneal sac, and now unites the extremities of the gut. If the prominent ridge be not too considerable, the intestinal contents may pass from the upper portion of the tube into this membranous cavity, and thence find their way into the lower portion. The gradual contraction of the wound closes the membranous cavity externally, and thus the continuity of the canal is restored. The two ends, however, are not joined so as to form a continued cylindrical tube, like that of the natural gut; but they are united at an angle more or less acute, and the matters which go from one to the other describe a half circle in a newly formed membranous cavity that completes the canal.

SECTION II.—TREATMENT OF MORTIFIED INTESTINE,
WHERE A PART ONLY OF THE TUBE HAS BEEN STRAN-
GULATED.

The vomiting, pain, restlessness, distress, and extreme constitutional disturbance, are caused by the distention of the alimentary canal above the stricture, and will not cease till that is unloaded. The first and most urgent indication is to procure this relief, which we should hasten to afford, even if it were simply to rescue a patient from a condition of severe suffering. But it is also essential, as a means of averting the impending fatal termination, and thus giving an opportunity for the completion of those salutary processes, by which more or less perfect restoration may be effected.

“The extreme distention,” says SCARPA, “of the upper part of the intestinal canal, and the increased action excited in it to free itself from the distending and irritating

* Mem. iv. § viii.

cause, are the principal source of the acute pains which the patient feels in the whole circumference of the abdomen, and especially in the umbilical region, which are much greater than those occasioned by the strangulated intestine. This state of violent irritation and increased action, always accompanied by great inflammation, and afterwards gangrene, is what, properly speaking, kills the patient, rather than the incarceration of the intestine included in the hernia. I am of opinion, that if the rupture of the strangulated intestine occurred much more speedily than it commonly happens, and before that portion of the intestinal tube continued from the stomach were subjected to the enormous distention and excitement, such as are observed in the dead bodies of those, who die of strangulated hernia, the event of this severe disease would not be, at least, either so quickly or so frequently fatal.”*

Let a free incision be made through the mortified part of the gut, in order to procure that evacuation of the loaded canal, which nature attempts by the process of gangrene. The sudden and marked alleviation of the symptoms, and the repose which usually follows, justify the measure, and sufficiently indicate the amount of the benefit conferred. If the intestine had already given way, a free division of the integuments and sac allows the exit of the accumulated matters, and prevents the extension of inflammation and sloughing by their infiltration into the surrounding textures: the opening in the gut may be enlarged, if it be not already sufficient.

It is well observed by Mr. TRAVERS, † that the division of the stricture is unnecessary; for the bowel is already relieved, at the expense of its life, by the natural process of mortification. If the feces issue freely, it is all we can wish; should the stricture be so narrow as to interfere with this discharge, an incision must be made to afford the requisite room. To ascertain this point, and also to discover whether there be any interior constriction, let the end of the little finger, or a female catheter, be cautiously introduced into the bowel.

This course was adopted by DUPUYTREN in the following case, which shews that it may be necessary to enlarge the stricture, even after the bowel has been opened by mortifi-

* *Treatise on Hernia*; English translation by WISHART; p. 296.

† P. 300 et seq.

cation. “ M. MAGNIEN, fifty-eight years old, of strong constitution and bilious temperament, was admitted into the Hôtel-Dieu on the 7th of August, 1817. For three years she had been the subject of reducible hernia, for which she had not worn a bandage. Fifteen days before admission she had been affected with colic, nausea, vomiting, hiccup and diarrhœa, followed, after some days, by constipation. She had an anxious countenance, whitish coated tongue, thirst, nausea, hiccup; a small, hard, and frequent pulse; swollen and painful abdomen. A roundish tumour was placed above the right crural arch; it was flattened, elastic, without fluctuation, painful on pressure; the skin was red and hot. At the upper and inner part of the thigh there was erysipelatous inflammation with equivocal fluctuation. Thirty leeches were applied to the abdomen; the swelling and the inflamed part of the thigh were covered with an emollient poultice. M. DUPUYTREN performed the operation the next morning: he found the adipous tissue in a state of suppuration, the sac of blackish colour; on opening the latter, a fetid sero-purulent fluid escaped. A convolution of intestine was strangulated; it was black and thick, and preserved its tubular form: it presented two whitish or greyish spots of some lines in diameter. In the situation of these sloughs, a longitudinal incision was made, eight or ten lines in extent; no fecal matter escaped. On introducing a catheter, some spoonfuls flowed out. M. DUPUYTREN then examined the part with his little finger, and found the stricture so considerable, that it would not admit the end of that finger. With the hernia knife, carried along the finger, he divided the intestine, neck of the sac and tendon. An abundant evacuation followed. The bowels were effectually relieved; the abdomen subsided; and, by the seventh day, the appetite had returned. After colicky pains for two days, fecal matter passed by the anus on the tenth day. On the eighteenth, the quantity discharged by the anus, and the artificial opening was about equal: compression was now tried on the latter; but it gave rise to nausea and vomiting, and was therefore discontinued. In another week the artificial anus was reduced to a fistulous opening, through which a yellowish transparent fluid escaped. In ten weeks the cure was complete. When this patient was seen, at some distance of time, the hernia had returned.” *

* JOBERT *mal. chirurg. du canal intest.* tom. ii. p. 69.

When the intestine has been opened, and the stricture has been removed, if that should be necessary, fomentation and poultice may be employed to reduce inflammation and assist the discharge of sloughs ; matter may be evacuated by suitable incisions, and strict attention must be paid to cleanliness. We trust to nature for restoring the continuity of the canal, and the natural course of the intestinal contents, being satisfied with removing any obstacles that might interfere with these objects. The strongest proof of wisdom in the surgeon will be, to abstain from all interference that might interrupt the salutary operations of the constitution. The intestine is adherent to the peritoneum about the ring, and to that portion of the membrane, which forms the neck of the sac : these adhesions are of the greatest importance in the subsequent progress of the cure ; and should therefore never be disturbed. The measure of dividing the stricture, which in most cases is simply unnecessary in reference to the state of the intestinal canal, is absolutely injurious, because it cannot be done without destroying the adhesions more or less extensively. To pass a finger into the ring, and turn it round, so as to detach the gut, is an act of gratuitous mischief, indicating a degree of ignorance, and thoughtlessness almost criminal.

Whether the intestine should have given way spontaneously, or have been opened by the surgeon, mild purgatives and clysters will be proper to unload the bowels, and to determine the course of the feces towards the anus. The use of both these means with the latter object, constitutes an important part of the treatment in all cases of mortified intestine. If the patient should be weak, and the vital powers seriously depressed, cordials and stimuli may be cautiously administered, with nutritious diet in the fluid form. In general, the diet should be mild and simple, given in small quantities, so as not to oppress the stomach, and repeated according to the patient's feelings. As the appetite and strength return, a greater quantity of support may be allowed, especially if the matters introduced into the stomach escape quickly through the artificial opening. In that case, we should select the forms of aliment, which are most nutritious in proportion to their bulk ; and we should always prefer those, which produce the smallest amount of fecal residue. Animal broths and jellies, milk, eggs, rice, and other farinaceous articles, are the best suited to our purpose.

If the patient would abstain from eating and drinking, and take nourishment in the shape of clysters, the passage of feces through the wound might be prevented, and its closure thereby promoted. By means of food introduced in this manner, a person has been not merely kept alive, but well nourished for six weeks.

This plan, suggested by ACREL, was found very serviceable in the following case. *

CASE.—A man, twenty-six years of age, was admitted into the royal hospital of Stockholm, for an incarcerated inguinal hernia of the right side. The intestine, when exposed by the operation, not being discoloured, was replaced in the cavity, and the case proceeded favourably until the thirteenth day. Excrements were now observed in the wound; and they soon came altogether by that way. As the means employed for this patient's relief produced no good effect, it was resolved to nourish him per anum, and allow nothing to be taken by the mouth. ACREL had previously introduced his finger with caution into the wound, and states, that the affected intestine was the cæcum, in the large cavity of which he could move his finger freely. A clyster was administered every morning to clear the canal; and a certain quantity of broth, with the yolks of eggs, was injected twice a-day, at ten in the morning, and six in the evening. The patient was nourished in this way for thirty-six days, during which time he became thin and weak. When the upper part of the canal was cleared of its contents, pure bile flowed through the wound, producing pain and excoriation, which distressed the patient exceedingly. A spoonful of broth was occasionally given by the mouth, to obviate these effects; and a small quantity of excrement again appeared at the groin. The wound improved in its appearance, and contracted in size: pressure was used, and caustic was occasionally applied to the edges. After the opening had contracted, so as to prevent the passage of the feces, a fetid moisture, discolouring the linen, still came through for fourteen days, and then ceased to flow.

Even after the wound has closed, the patient cannot be considered free from danger. The loss of substance, which the bowel has undergone leaves behind a diminution of the canal, and consequent liability to obstruction from irregu-

* *Der Königl. Schwedischen Akademie neue Abhandlungen*, tom. viii. p. 36.

larities of diet ; the intestine may give way from pressure above the stricture, and pour its contents into the abdomen, destroying life after a short but violent disturbance. This happened in a case observed by Mr. A. BURNS. A crural hernia, left to itself, proceeded to suppuration and mortification with discharge of the intestinal contents. The ulcer of the groin slowly closed, and was healed in less than two months. The patient returned to her ordinary occupation of beating cotton, which she found too laborious. She had abandoned this for a year, when she died after an attack of inflammation of the bowels. The abdomen exhibited the result of general inflammation, with lymphatic exudation and sero-purulent effusion. The protruded bowel was the middle of the ileum, above which the canal was much enlarged, being contracted below it. The whole diameter had not been included ; but so much of it, as to leave a passage between the upper and lower part of the gut not larger than a goose quill. The latter had given way close to the contraction, and exhibited an opening a few lines in length, through which the contents of the bowel had escaped into the pelvis.*

SECTION III.—TREATMENT WHERE A SMALL SPOT ONLY
HAS MORTIFIED.

When a larger portion of intestine has descended, it may be affected with gangrene, in one or more spots, the rest remaining comparatively sound ; or it may have become mortified through a greater or less extent of its diameter. Various proceedings have been adopted in the former case. It has been recommended that the gut should be left in the wound, after removing the stricture ; in addition to this, some have advised excision of the mortified part.† Others have returned the intestine, retaining it in the neighbourhood of the ring, by a ligature passed through the mesentery, and confined externally by adhesive plaster. The fear that fecal matter may be effused into the cavity of the abdomen, on the separation of the slough, forms the ob-

* MONRO, *Morbid anatomy of the gullet*, p. 399.

† RICHTER, *Tr. des Hernies*, p. 150.

jection to returning a mortified portion of gut: and the intent of the ligature placed in the mesentery was to prevent the possibility of this effusion, by keeping the sphacelated part opposite the ring. The foundation of these apprehensions must be carefully examined, before we can fairly appreciate the treatment which they have suggested. Two questions here offer themselves for discussion: whether a replaced portion of intestine usually leaves the ring, and moves to some distant part of the cavity? and whether, on the separation of the sphacelated part, an effusion into the abdomen may be expected?

The inflammation, which precedes the mortification of the intestine, is generally found to extend along the canal, and to agglutinate the neighbouring parts to each other, and to the abdominal parietes. Thus the returned gut is mechanically confined to the neighbourhood of the ring, and a barrier is opposed to its removal from that part. If adhesions had not formed previously to the operation, which probably is seldom the case, they may be expected to take place afterwards; for, when a fatal termination enables us to ascertain the state of the parts after death, we usually find the replaced viscera close to the ring, and adherent to the surrounding parts. DESAULT states the result of his experience on this point in the most unqualified terms: he has learned from dissection, that the portion, which formed the hernia, never recedes from the ring.*

The authority of DELAFAYE may be cited in farther confirmation of this point. "When the intestine sloughs after being returned into the abdomen, we might," says he, "apprehend an effusion of feces into the cavity; but this fear is groundless, as the intestine remains opposite the ring: accordingly the contents of the bowels come through the wound some days after the operation."†

I have witnessed the same fact in many instances; and, indeed, have almost always found the replaced intestine near the ring. Numerous testimonies might be cited to the same effect.

When it is proved, that the returned part remains near to the ring, we need not fear effusion into the abdomen. The wound of the operation affords the most ready exit for the fecal matter, which escapes in that direction.

We need not, however, fear that the feces will spread

* *Parisian Surgical Journal*, vol. ii. p. 366.

† *Cours d'Operations de DIONIS*, ed. v, p. 350, note a.

over the abdomen, even if the intestine were not exactly against the ring. PETIT,* in his excellent Memoirs on Effusions, has long ago refuted the received notions on this subject both by facts and reasoning: he has clearly shown, that the contents of the intestine, or blood, shed in the abdomen, do not spread loosely over the cavity; that the pressure of the respiratory muscles affords the obstacle to such an extension; that the effused matters, being poured out in opposition to considerable resistance, are collected in one spot, to which they become confined by the inflammatory agglutination of the contiguous parts, and where they form what the French call a *depôt*.

The effects of this pressure, arising from the action and reaction of the muscular parietes and contained viscera, in preventing the escape of the contents of the latter, are well illustrated by penetrating wounds of the abdomen. Persons have often recovered, without internal effusion, after having been run through the body, or stabbed. Experiments on animals, performed by Mr. TRAVERS, have shown, that punctured wounds of the intestines are generally closed by adhesion, and not followed by escape of fecal matters. Sometimes, however, breaches of continuity in the intestines are followed by extravasation of the contents. If the wound be incised or punctured, the intestine empty or only moderately filled, the size of the aperture small, and its direction transverse, adhesion may be expected. On the contrary, the contents will probably escape, where the opening is lacerated, or made by ulceration, the bowel full, the wound large, and its direction longitudinal. The most clear and satisfactory account of the whole subject will be found in the three first chapters of Mr. TRAVERS's work.

We may then conclude, as the annexed cases will clearly demonstrate, that the alimentary matters, effused from a mortified intestine, will probably find their way through the wound, and not be spread over the cavity.

If we have no reason to fear, either that the intestine should move from the ring, or that its contents should be effused into the abdomen, there can be no doubt as to the conduct required, where a portion only of the gut is affected with gangrene: we should replace it in the cavity, with the mortified portion towards the wound, and await the result of the operations of nature without interference. A liga-

* *Mémoires de l'Académie*, tom. i. & ii. See particularly the "*Essai sur les Epanchemens du bas ventre*," in the second vol.

ture in the mesentery is unnecessary. In these, as in all cases of mortified intestine, rigid attention to diet is indispensable. Here too as in the last mentioned case of mortification, the use of purgatives and clysters is required, for the same reasons as were then stated. The event will be influenced by various circumstances, which are but little under the control of the surgeon.

It is unfortunate when the opening is in the upper part of the intestinal canal.* The most favourable termination is when the alimentary matter, after finding its way for some time, either wholly or in part, through the wound, gradually resumes its natural course. The powers of the patient may sink under the disease, or he may recover under the distressing necessity of voiding his excrement through the wound.

The following case proves that the conduct, which has been now described, may be followed, not only without ill consequences but with complete success; that the contents of the intestine, when the dead part gives way, come through the wound, instead of spreading over the cavity; and, consequently, that the replaced bowel does not quit its position behind the ring.

CASE.—EDWARD TUBBS, a sailor, twenty-two years of age, was admitted into ST. BARTHOLOMEW'S Hospital, under the care of Mr. LONG, with a strangulated scrotal rupture. The operation was delayed longer than it would otherwise have been, by the patient's refusing for some time to submit to it: but there were no symptoms nor appearances indicating the occurrence of mortification. When he at last consented, the contents of the rupture were found to consist of what has been termed a knuckle of small intestine. Mr. LONG observed, when he opened the sac, that the contained fluid

* In a case where every thing was going on well, the patient died from want of nourishment; the opening having taken place in the jejunum: COOPER, pt. i. p. 33. A similar instance is recorded in the *Giornale di Medicina*, vi. p. 401. Two cases are quoted in the *Mem. de l' Acad. de Chir.* tom. v. p. 597, from HOIN'S *Essai sur les hernies rares*, where the same circumstance led to a fatal termination. DESAULT ascribes to this cause the death of a patient, in whom the opening took place at the end of the ileum; *Œuvres Chirurg.* t. ii. p. 356. A patient of Sir A. COOPER'S, in whom the lower portion of the ileum had been protruded, died from defective nutrition nine days after the operation; all aliment, whether solid or fluid, passing off very little changed in the space of an hour. *Anatomy, &c. of Crural and Umbilical Hernia*, chap. vii. p. 31. In a case of this kind the most nutritive food, such as strong soup and jellies, should be taken frequently in small quantities, in order to afford an opportunity for the greatest possible absorption. Broth and milk may also be thrown up per anum.

had a fecal smell. The ring, which formed a very close stricture, had made a manifest impression on the gut ; and a small pinhole appeared in this part, through which the alimentary matter came. A broad patch of the posterior part of the intestine was manifestly gangrenous ; and a smaller portion of the convexity of the fold appeared in the same condition. The gut was returned ; and evacuations were procured per anum, by means of clysters and purgatives. In three days the contents of the bowels began to be partly discharged through the wound ; and in a short time they all came that way. The evacuated matter was a light yellow frothy fluid, mixed with flakes of a more consistent kind. It had no fecal smell ; and was discharged in less than ten minutes after drinking. It caused great inconvenience to the patient, by excoriating the groin ; and this was partly remedied by fastening a piece of moistened bladder with sticking plaster close to the edge of the sore, and allowing the discharge to run over this. The general health was perfectly good. In three weeks he began again to have motions per anum, which increased in quantity, while the discharge by the wound was diminished ; and this consisted at last of a mere froth. In a short time the wound had completely cicatrized, and the man was discharged perfectly well.

The fifty-ninth observation of LE DRAN* is a case in which the intestine gave way on the eleventh day after its replacement in the abdomen. The feces came through the wound, and the patient recovered. "Experience," he says, "has convinced me, that the ligature in the mesentery may be omitted when the intestine has opened, or is ready to open by mortification ; because the inflammation preceding it always produces an adhesion of the intestine."

In an instance mentioned by Sir A. COOPER,† the intestine was replaced, without being confined by a ligature. The feces made their appearance after ten days ; and passed for eleven weeks, partly through the wound, partly per anum : at the end of this time their natural course was re-established. Two other facts, in proof of this point, are furnished by PETIT ;‡ SHARP§ speaks in general terms of the

* *Observations in Surgery*, p. 200.

† Pt. i. p. 35.

‡ *Mémoires de l'Acad. de Chir.* tom. ii. p. 93 and 94.

§ *Critical Inquiry*, p. 42.

great number of cases where the feces have been safely discharged through the wound from a gangrened intestine.*

To the evidence already adduced I may add the testimony of DESAULT, whose experience on this point is decisive. In operating on a hernia, he found an eschar of an inch in diameter on the intestine. He returned this part, and no subsequent symptoms occurred to denote the separation of the slough. He conceives that the inflammation of the part surrounding the eschar agglutinated it to the parietes of the abdomen; and that the slough passed along the intestinal canal. But it is not on the event of a single case that he rests the propriety of this practice: he recommends it from the favourable result of his general experience. He has relinquished the loop of thread through the mesentery; “being convinced by experience, and particularly from dissection, that the portion, which forms the hernia, never recedes from the ring, and that there is no reason to apprehend an effusion into the abdominal cavity on the separation of the eschar.”†

From a consideration of all the facts connected with the history of mortified hernia, SCARPA had deduced the complete inutility of the ligature in the mesentery.‡ The same conclusion is established by Mr. TRAVERS on similar grounds.§

Although the practice of returning into the abdomen intestines, of which a portion has mortified, rests on apparently good reasons, derived principally from the facts furnished by pathological anatomy, from the results of penetrating wounds and from experiments on animals, although it has been followed in many instances with suc-

* In a dissertation by MALAVAL, *an tenuium intestinorum vulnus lethale*, two cases are mentioned, in which feces came through the wound some days after the operation; but the patients recovered; HALLER, *Disput. Chirurg.* tom. v. p. 77. Mr. WATSON found an oval gangrenous portion of an inch in length, in the intestine, and returned it, keeping the mortified part towards the wound. The feces appeared on the third or fourth day, but took the natural passage very soon after, and the patient recovered: *Med. Communications*, vol. ii. p. 102. Similar instances are mentioned in the *Mem. de l'Acad. de Chir.* tom. ii. p. 93; in the French Medical Journal, entitled *Journal de Médecine, Chirurgie, Pharmacie, &c. par M. LE ROUX*; tom. xxi. p. 124; in the *Giornale di Medicina*, vi. p. 401; and xi. 25; in the *Neue Abhandlungen der Schwed. Akademie*, viii. p. 36; in THEDEN, *Neue Bemerkungen*, p. 99; in the *Journal de CORVISART*, tom. xxv. p. 169; in SCARPA, m. iv. § 21.

† *Parisian Surgical Journal*, vol. ii. p. 366.

‡ *Sull' ernie*; *Mem.* iv. § 13.

§ *Inquiry, &c.* p. 296 et seq.

cessful result, and has been recommended by the highest surgical authorities, I do not feel satisfied that it is a perfectly safe proceeding. I fear that it might be sometimes attended with fatal effusion into the cavity of the peritoneum. The intestine replaced in the operation for strangulated hernia is occasionally found after death removed to such a distance from the ring, that, if its coats had given way, a fatal result would have been inevitable. In the case, therefore, of partial gangrene in an unadherent portion of intestine, I should be afraid to return the bowel into the cavity, and should prefer leaving it in the wound, or just pushing it within the mouth of the sac, and retaining it in that position by a loop of thread in the mesentery.

If we should find that the intestine, in the neighbourhood of the mortified portion, is adherent, either to the neck or mouth of the sac, we should follow the course already pointed out; that of opening the bowel to let out its contents, removing the impediment, if there should be such stricture as to interfere with that object, and leaving the part otherwise undisturbed.

When the intestine is unadherent, our conduct might be influenced by the size of the mortified portion, and the state of its coats. If the gangrenous spot were less than half an inch in diameter, and the morbid change were in its first period, we might return the bowel, expecting it to become adherent to the surrounding parts, so that the slough, on its separation, would pass into the canal. If the coats of the mortified part had already lost their natural consistence, so that perforation might be expected within a short time, it would be better to open the bowel and retain it in the wound.

If the dimensions of the mortified portion should exceed half an inch, and more particularly if the process of decomposition were advanced, the safest course would be either to open and retain it in the wound, or to push it into the neck or just within the mouth of the sac, and prevent it from quitting that situation by a ligature in the mesentery.

The ligature for this purpose should be a broad waxed thread, passed through the anterior edge of the mesentery by means of a broad curved needle, or of an eyed probe. The ends are not to be united, but carried out of the wound separately, one on each side, so as not to press on the intestine; they may be fastened by a small piece of adhesive plaster. Or, the ligature may be passed through

the mesentery from before backwards, and then brought out again from behind forwards, at one-fourth or one-sixth of an inch distance; the loop thus formed being carried out of the wound at its upper angle. As the portion of intestine confined in this manner to the neighbourhood of the ring may be expected to become speedily adherent, the thread may be withdrawn in twenty-four or forty-eight hours.

Mortification of the appendix cæci.—I have seen the appendix cæci returned into the abdomen, when a small part of it had sphacelated; and, as the case is interesting in another point of view, I shall shortly state the particulars.

CASE.—ANN STILLWELL, forty-eight years of age, had been subject for some years to a crural hernia, which became strangulated on the 3d of July, 1809. She was admitted into ST. BARTHOLOMEW'S Hospital on the following evening, opening medicines having been freely administered without producing any effect. As no evacuation could be procured by the repeated employment of calomel with the colocynth pill, in large doses, the operation was performed on the evening of the sixth. The appendix cæci, of which a small spot had sphacelated, with its little mesentery considerably loaded with fat, so as to give the feel of omentum before the operation, formed the contents of this rupture; and it was replaced without any incision of the stricture, although the opening was very small. The progress of the case, subsequently to the operation, was favourable in every respect; and the wound had completely cicatrised on the nineteenth day.

AMYAND* found the appendix cæci perforated by a pin in an inguinal rupture. He removed the part, after placing a ligature between the perforation and the intestine; and the patient recovered without any unpleasant consequence.

SECTION IV.—MORTIFICATION OF THE WHOLE CYLINDER OF THE INTESTINE.

When the whole cylinder of the intestine has mortified, it has been deemed advisable to cut away the dead part, and to unite artificially the divided ends of the bowel.

* *Philosophical Transactions*, vol. xxxix, p. 329.

Various expedients have been resorted to for the latter purpose. In ancient times the bowel was firmly sewn up by the glover's or uninterrupted suture; this, and the modifications of suture proposed by LE DRAN and BERTRANDI, need not be particularly described, as they have been long disused.

RAMDOHR,* a German surgeon, recommended that the superior extremity of the gut should be introduced into the inferior, and that they should then be sewn together. It has been further proposed to support the ends of the bowel by placing substances of some solidity in the canal, in order to facilitate the process of enteroraphy, and perhaps to prevent subsequent contraction at the point of union. FABRICIUS, of Aquapendente, condemns the practice, which some followed in his time, of introducing into the canal, before they sewed up the intestine, a canula, either of elder, or of the trachea or intestine of an animal. The surgeons of the last century recommended for the same purpose a portion of animal's trachea,† a cylinder of varnished card,‡ of isinglass,§ or of tallow. These expedients are described with so much minuteness and formality, that an inexperienced person might suppose they had all been brought to the test of practice. They have, however, very seldom been tried.

It is by no means easy to execute the invagination of the superior portion of intestine, as recommended by RAMDOHR. In order to have at our disposal a sufficient length of the bowel, it would generally be necessary to draw out an additional portion from the abdomen. The upper part, which is to be introduced into the lower, must be separated from the mesentery, and the bleeding of the divided vessels must be arrested. When the intestine is cut through in a living animal, the muscular fibres contract and retract, and the mucous membrane is everted so as to form a thick prominent ring. Hence the invagination of the bowel can never be accomplished easily; while in many cases it has been found impracticable. We shall not be surprised at this, when we consider the disproportion in size between the two ends of the bowel in many cases; the intestinal canal

* MOEBIUS, *observat. med. miscellan.*; præside HEISTERO, 1730. Obs. 18. See also HALLER, *disp. anat.* tom. vi, p. 745; and HEISTER, *instit. chir.* p. 817.

† DUVERGER, in the *Mem. de l'acad. de chirurgie*; tom. iii. p. 188.

‡ RITSCH; *ibid.* tom. iv. p. 177.

§ WATSON, in *medical communications*, vol. ii.

being distended above and contracted below the stric-
tured portion. If, however, the process were as easy
of execution as it is the contrary, it would still labour
under the insuperable objection of being totally incapable
of accomplishing the intended object, that of restoring the
continuity of the canal. The serous membrane of the
superior or invaginated portion is in contact with the mu-
cous membrane of the lower, and union cannot be effected
between them.

M. JOBERT has proposed a method of invagination, in
which the serous surfaces of the two portions of bowel are
brought into contact. He observes, that in a mortified
hernia the escape of the intestinal contents would show
which was the upper end ; while, in the case of division by
a wound, the method proposed by LOUIS would be best,
namely, to give the patient some oil, and notice at which
end of the bowel it flowed out. He then separates the supe-
rior and inferior end from the mesentery, and waits until
the bleeding has ceased, or stops it by tying the vessels.
A ligature is carried through the coats of the upper extre-
mity opposite to the mesentery. The end of the lower
portion is next turned in upon itself, and then the upper
portion is introduced into the lower thus prepared. The
ligature already placed in the upper is carried through the
lower part beyond the point to which the inversion extends,
and the drawing of this ligature unites the parts, the
serous membrane of the upper or invaginated being in con-
tact with the serous surface of the inverted portion of the
lower extremity. M. JOBERT trusts to a single suture,
having found that the multiplication of sutures in the dog
leads to a failure of the experiment.* This course of pro-
ceeding, which succeeds in animals, has not been employed
by its proposer in the human subject. I find, however, the
following notice on the subject in the *Archives générales*.†
“ Mr. J. CLOQUET communicates (to the royal academy of

* *Recherches sur l'opération de l'invagination des intestins, par M. JOBERT, interne des hôpitaux de Paris* : in the *Archives générales*, tom. iv. 1824. See also his *Traité des maladies chirurgicales du canal intestinal* ; tom. ii. p. 88—94.

† Vol. xi. p. 648. 1826. I have already quoted a case of simple wound in the intestine, for which M. CLOQUET employed suture with success ; see *ante* p. 306. I suspect that the case mentioned in the text is merely another version of the same fact ; for M. JOBERT, who relates the case of wounded intestine in his work published in 1829, makes no mention of any instance in which invagination had been practised in the human subject, except one in which he performed it on a female, who survived only fifteen hours. *Traité des mal. chir. du canal intest.* tom. ii. p. 91.

medicine) a case of strangulated hernia, in which the whole diameter of the bowel had mortified; he practises suture of the intestine according to the method of M. JOBERT. The part was returned as soon as it had been ascertained that nothing escaped from the bowel on pressure. No symptoms have ensued; fifteen days have elapsed, and everything promises an early cure."

This process is more complicated and must be still more difficult of execution than that of RAMDOHR. Both ends of the intestine are separated from the mesentery, with increased risk of bleeding. That this is a source of real danger appears from a case, in which it is said that seven mesenteric arteries were tied, and the patient died from hemorrhage into the abdomen.* The eversion of the mucous membrane must make it very difficult to invert the lower orifice of the bowel, and keep it in that state.

But much greater difficulty would be experienced in introducing the larger superior into the smaller inferior portion, already diminished in capacity by the inversion. Admitting, however, the practicability of the plan, and supposing that the inverted and invaginated parts were kept in their situations, and further that the two serous surfaces had become united, it may be doubted whether this combination of inversion and invagination, by which nine layers of membrane are accumulated in one point of the canal, with a serious encroachment on its calibre, would be compatible with the proper performance of the intestinal functions.

In other plans proposed for uniting the ends of a divided intestine by their serous surfaces, the introduction of foreign substances into the canal has formed part of the proceeding. This is the case in the methods of M. M. DENANS and AMUSSAT.† In the former, three hollow metallic cylinders are introduced into the gut, and fastened to it by sutures, the bowel thus charged being returned into the abdomen! A patient who could survive the infliction of such surgery, must be endowed with great tenacity of life.

My own opinion is altogether unfavourable to the plan of union by invagination, whether according to the method of RAMDOHR, or that of JOBERT; nor can I approve any one of the various proposals just enumerated and con-

* *Répertoire*; vol. ii. p. 102.

† These methods are mentioned shortly by M. VELPEAU, *médecine opératoire*, tom. ii. p. 422, and by M. FLEURY, in his *mémoire sur la suture intestinale*; *Archives*; March, 1837.

sidered. Some of them are difficult of execution, some impracticable; none are recommended by the results of experience; while all are not only inconsistent with our knowledge of the processes, by which restoration is effected in these cases, but directly calculated to interrupt and subvert those processes. By drawing the intestine out of the cavity, in order to remove the dead part (supposing that the agglutination of the sound portion to the contiguous peritoneal surfaces of the sac, the abdominal parietes, and the surrounding convolutions, will allow it to be thus drawn out, which it often certainly will not,)* the adhesions, on which the prospect of a cure chiefly depends, must be entirely destroyed. An inflamed part cannot be handled and sewn, without causing new irritation and inflammation.

The separation of the slough by nature, or its division by the surgeon, allowing the distended alimentary canal to be unloaded, greatly relieves the patient; and the free discharge of the intestinal contents by the wound prevents the recurrence of distress. If we sew up the gut, and, still worse, if we stop up its cavity with tracheas, isinglass, card, cylinders of wood or metal, the part cannot resume its functions; obstruction again takes place, and when the patient's misery is at its height, perhaps nature, by tearing open this ill-advised union, may avert impending destruction.†

Cases are recorded, in which the proceedings alluded to above are said to have been successfully employed in mortified herniæ. RAMDOHR, who first proposed the introduction of the *superior* into the *inferior* end of the gut, relates that the patient, on whom he employed his method, a woman with crural hernia, and in whose case he removed two feet in length of the intestine, together with a portion of mesentery in a gangrenous state, recovered. She died of another complaint in a year; and the intestine was removed and given to HEISTER, who preserved it in his museum. DUVERGER‡ removed a piece equal in length to two fingers, and united the ends on a portion of calf's trachea, with sutures: his patient got well speedily. Other

* *Journal de M. LE ROUX*, tom. xxi. p. 260. The surgeon wished to perform enteroraphy, but was prevented by the adhesions.

† See the cases quoted further on, (p. 358—360,) in which the attempts at union have failed.

‡ *Mém de l'Acad. de Chirurg.* tom. iii. p. 188.

examples are referred to ; of one I do not know the particulars ;* two others appear to me very suspicious.†

What then can be opposed to these successful examples ? How can our unfavourable opinion of the practice followed in them be justified ? The great number of instances in which it has not succeeded, and particularly its uniform failure in this country, combined with the objections stated to it above, lead me to entertain some degree of incredulity respecting these narratives ; or, if they should be found to rest upon unexceptionable authority, to conclude, that the successful termination was brought about not in consequence, but in spite of the artificial union of the intestine.

The injurious effects of sewing together the ends of the gut, after removing the mortified part, and the efforts of nature to set aside the obstacles thus thrown in her way, are well illustrated in a case witnessed by that accurate observer, my late much valued friend, Dr. CHESTON, of Gloucester, by whom it was communicated to Sir A. COOPER.‡ Four inches of mortified intestine having been removed, “ the first thought which occurred was the truly pitiable state to which the patient would be reduced in the event of his recovery, by having an artificial anus. Desiring, therefore, if possible, to avoid such a composition for existence, we agreed to bring the gut together by the usual recommendation of gastroraphy. This being effected, and to guard against any ill consequences on the failure of the intention, from a retraction of the intestine into the cavity of the abdomen, two stitches were passed through the mesentery on each side of the divided intestine, and secured to the parietes of the wound.” Mr. NAYLER, the operator, on the following evening “ found the young man by no means benefited by the operation. No evacuations had passed by stool, his belly was rather more distended, he was equally sick as before, and now and then teased with hiccup. In this alarming state Mr. NAYLER thought it necessary to remove the dressing for the inspection of the part, when observing the wound to bear a very unhealthy aspect, he thought it necessary to remove the stitches on the intestine, bringing its open extremities just without the edges of

* SCHMIDT, *Diss. de Ileo* ; in CREUTZENFELD, *Biblioth. Chirurg.* p. 844.

† *Journal de Médecine, Chirurgie, &c. de M. LE ROUX*, tom. xxiii. p. 358, tom. lvi. 151. It is strange, that in both these cases, although the union of the gut is said to have been perfect, the patients died in about five weeks after the operation.

‡ *On Inguinal and Congenital Hernia*, p. 37.

the wound, to allow of an easy discharge of air or feces contained in the superior part of the canal. In the course of the night, when the patient appeared almost expiring, a sudden and violent discharge of air and feces burst forth from the wound, in immense quantity, to his immediate relief. His pulse rose, a comfortable warmth succeeded, his stomach became settled, and his hiccup left him; in short, every prospect brightened, and from that day each symptom became more promising. On the tenth day, the parts looked so well and healthy, that Mr. NAYLER, hoping there was still a possibility of diverting this most loathsome evacuation from the groin into its natural channel, by another attempt to procure an union of the divided portion, once more brought the extremities together by suture. Unfortunately, this likewise failed in the extent proposed, most of the stitches giving way to the continual pressure to which they were exposed." The feces then came entirely by the wound; but some time afterwards, on applying pressure to it, a natural inclination for a stool was felt, and it was found, that by the application of a truss to the part, the escape of the alimentary contents could be almost entirely prevented. It appears, that the two ends of the gut were united by a surrounding common cavity, in the manner that will be more fully described presently; and that the contents were transmitted from one to the other through this, when the deficiency in the external part, that ought to have been filled up by the curative process, was supplied by artificial means.

Sir A. COOPER* has mentioned two other instances, in which suture of the intestine was practised. In one of these the feces came through the wound, from the time of the operation; in the other no discharge took place, either per anum or through the groin, till some time after the operation, when an evacuation through the wound greatly relieved the patient.

BARON BOYER† performed enteroraphy, with no better success. He opened the intestine, which was mortified to the extent of four inches, and thus allowed the escape of its contents, to the great relief of the patient. He gave mild opening medicine to unload the bowels, and also to enable

* *On Crural and Umbilical Hernia*, p. 30 and 31.

† *Traité des maladies chirurg.* tom. viii. p. 169. The case is also related by HEYLIGERS in *Mém. de la Société Med. d'Emulation*, tom. i. p. 127.

him to distinguish the upper end of the gut, which however was sufficiently obvious from its considerable dilatation. On the next day he cut away the mortified part, and united the two ends, according to the method of RAMDOHR, introducing the superior, supported by a cylinder of card, into the inferior; which process he says was very long, tedious, and extremely painful in its execution. When it was finished, he could not return the gut, distended as it was by the card, without a considerable enlargement of the ring. The patient grew decidedly worse during this second operation; the symptoms of strangulation, which had been removed by the free issue of fecal matter through the mortified intestine, were renewed, and destroyed the patient in sixteen hours.

M. VELPEAU mentions that BOYER had tried invagination in another case, but could not accomplish it. He adds that he had seen it attempted by M. RICHERAND, at the Hôpital Saint Louis in a patient who died on the following day.*

PLOUCQUET's *Bibliotheca* affords the following notice of an unfortunate case. "Infauste tentata reunio marginum intestini sphacelati rescissi per chartam vernice obductam."†

Sutures have often been successfully employed in wounds of the intestine, and several instances are mentioned in CHAPTER XI., SECTION 5. If these, however, were more numerous than they are, they would not induce us to adopt the same practice in mortified hernia. In the former case the healthy state of the gut, of the abdominal cavity, and of the constitution, are favourable to that natural and healthy adhesion, on which the success of the treatment so much depends; while there is little reason to expect this favourable result where the bowel and peritoneum are inflamed, and the constitution consequently disturbed. In the case of wound, too, the gut is unadherent; while, in most sloughing ruptures, it will be found to have contracted connexions to the surrounding parts, preparatory to a natural process of cure, and not separable without dangerous increase of irritation and inflammation.

Even in wounded intestines we have many examples of

* *Médecine opératoire*, tom. ii. p. 419.

† AYRER in LODER'S *Journal für Chirurgie*, &c. vol. i. p. 526. SCARPA quotes another from the *Annales de Littérature Méd. étrangère*, Avril, 1809, p. 320.

successful result without the employment of sutures, while the cases in which a favourable termination can be ascribed to them are so few, that the propriety of enteroraphy has been doubted.

“Confiding,” says SCARPA,* “in these principles, deduced from the comparison of penetrating wounds with injury of the large intestine, with the protrusion and wound of the small intestine, I admit the possibility of curing the latter without the assistance of sutures. Nor do I want examples of similar cures, among which I may mention a recent cure of small intestine, protruded and perforated incautiously by a country surgeon, in the act of pushing it into the abdomen with the point of a spindle. In this patient, without the assistance of any suture or ligature passed through the mesentery, the wounded portion of intestine remained in contact with the peritoneum, in the direction of the internal lips of the wound of the abdomen, from which the intestinal matters continued to pass for a long time, and then resumed their natural course, and allowed the external wound to cicatrize. This young man enjoys at present the most perfect health, and does not complain of any inconvenience depending upon the wound he had met with, nor upon the interruption of the passage of the feculent matters along the canal of the small intestine.”

Cases are recorded, in which a complete division of the small intestine has terminated favourably under similar treatment.†

If the successful employment of sutures in wounded intestines do not justify us in adopting them in cases of mortified hernia, still less can we find any argument for their use from experiments on dogs. Many injuries may be inflicted on these animals, with little ill consequence, that would be most injurious, or even fatal, to the human subject: hence we must be cautious in reasoning from one to the other. The state of the part and of the constitution, in a patient with mortified hernia and in a healthy dog, are so widely different, that all analogy ceases. Yet these researches on animals afford us useful information respecting the effects of sutures in the intestines: and they are referred to for this purpose in considering the management of wounded intestine, in CHAPTER XI., SECTION 5.

If a surgeon were disposed to practice enteroraphy in mor-

* *Treatise on Hernia*, by WISHART, p. 357.

† LARREY, *Relation chirurgicale de l'armée de l'orient*; p. 300.

tified hernia, the propriety of which seems to me in all cases doubtful, and should meet with an instance that he thinks favourable, he must adopt the course of proceeding laid down in CHAPTER XI., SECTION 5, as applicable to wounded intestines.

Last year Professor DIEFFENBACH published, in a weekly Medical Journal,* an interesting narrative of a case of hernia with mortification, in which he performed enteroraphy successfully. The following particulars are derived from a French translation of his statement, which appeared in the *Archives générales de Médecine*; Mars, 1837.

The patient was a husbandman, tall and strong, with a crural hernia of the right side, which had been strangulated fifteen days. Although the duration of the strangulation and the redness of the tumour rendered it probable that mortification had occurred, the operation was performed. A stinking fluid containing fecal matter escaped when the sac was opened, and a convolution of the intestine was exposed with an opening at its convexity large enough to admit the thumb. As the intestinal contents did not escape readily, even after the stricture had been divided, owing partly to the smallness of the hernial aperture, partly to the constriction, which the bowel had experienced, the professor destroyed the adhesions and drew a portion of the canal out of the abdomen. He then cut away the mortified part, being three inches in length, and a corresponding portion of the mesentery. The open ends of the bowel contracted, so that they would not admit anything larger than a writing quill, and the mucous coat was everted. The two ends were then united by a suture introduced according to the method of Mr. LEMBERT;† the intestine was returned. Nothing had passed through the bowels on the next day, although large doses of castor oil had been administered. Croton oil was now added, and the patient was ordered to get up and stand: copious evacuations ensued, with relief of all the symptoms. Castor oil and cherry laurel water were given internally, and the patient was well nourished. In a month he was recovered, and able to resume his country labours and hearty feeding. Some weeks after he became indisposed in consequence of excess; symptoms of constipation ensued, and the patient died. The small intestine had become obstructed about the middle of

* *Wochenschrift für die gesammte Heilkunde*; No. 26, 1836.

† See ante, p. 305.

the ileum in consequence of confinement of the part by adhesion on the left side of the abdomen. The portion of gut, which had been protruded, was situated nearer to the cæcum than the strangulated part: several convolutions adhered to the parietes about the right crural ring. In detaching them, a few drops of pus escaped, and a knot of silk was met with. When the intestine was laid open, its two ends were found united by a smooth cicatrix, half a line broad, interrupted at two points by the situation of sutures, which were still adherent to the surface. The portion of the bowel immediately above the union exhibited neither enlargement nor folds. The intestinal tunics, at the point of union, formed a prominence, the serous surfaces being there united by adventitious membrane, while the bowel itself was connected in the same way to the neighbouring serous surfaces.

When the intestine above and below the mortified part is not adherent, (a case which I believe to be rare,) LA PEYRONIE has recommended, after the removal of the dead portion, that a ligature should be placed in the mesentery, so as to draw this part into a longitudinal fold, and thereby approximate the two ends of the gut. He fastens this ligature on the outside of the wound, in such a manner as to retain the open extremities near the ring. The successful event of some cases treated on the above plan seems to justify the principles on which it is founded.* I have already pointed out the cases, in which it might be proper to place a ligature in the mesentery, for the purpose of retaining the intestine near the ring. (See *ante*, p. 352.) The measure of cutting away the dead part seems to me unnecessary. I think it would be sufficient to open the intestine freely in the mortified portion.

A different treatment has been proposed by LITTRE;† he retained the superior extremity of the intestine in the wound, and tied the lower. This plan has gained the approbation of M. LOUIS,‡ who considers it as preferable to the proceeding of LA PEYRONIE. I cannot think a surgeon justified in directing his treatment expressly to the formation of an artificial anus, and thereby taking away all chance

* *Mémoires de l'Acad. des Sciences*, année 1723; *Mémoires de l'Acad. de Chir.* tom. i. "Observations avec des reflexions sur la cure des hernies avec gangrène," p. 337.

† *Mémoires de l'Acad. des Sciences*; année 1700.

‡ *Mémoire sur la cure des hernies intestinales avec gangrène*, in the *Mém. de l'Acad. de Chir.* tom. iii.

of that entire recovery, which the powers of nature have accomplished in so many instances. This practice, in its complete success, renders a person disgusting to himself, and to those with whom he associates. It really becomes a question, whether life itself be desirable, if burthened with such an afflicting infirmity as the discharge of the feces through the groin.

After thus objecting to the various modes of treatment, which have been proposed for a mortified intestine, it remains for me to mention the conduct which a surgeon should pursue in such a case. It is, to make a free incision through the mortified part, in order to unload the distended intestinal canal: or, if the gut should have already given way, to divide freely the integuments and sac; and to leave the subsequent process of the cure entirely to nature. In providing, by these measures, for the discharge of the accumulated fecal matter, we only anticipate the relief which nature is hastening to afford, and we disturb none of her operations. The marked benefit experienced by the patient from removing this great source of irritation and distress, has been so strongly depicted by all the best observers,* that no doubt can be entertained of the propriety of the treatment. The rest of the cure is accomplished by nature. The sloughs will be cast off; the ends of the gut are retained by the adhesive process in a state of apposition to each other, most favourable for restoring the course of their contents; the wound contracts, and often completely closes, so that the continuity of the alimentary canal is perfectly re-established. The interference of art can only be prejudicial. When we consider the loose state of the intestinal canal, in its natural condition, we find a difficulty in conceiving how its continuity can be restored, after considerable portions have perished: yet indubitable proofs of this fact exist, and induce us to place confidence in the resources of nature.

The work of SCARPA† contains the best description of the process, by which restoration is effected, after mortification of the intestine. The peritoneum forming the mouth and neck of the hernial sac becomes connected to the sound

* See the cases quoted below from PETIT; also GOOCH's *Works*, vol. ii. p. 197 et seq.; PELLETAN, *Clinique Chirurgicale*, vol. iii. p. 90 and 94; HEY's *Practical Observations*, third edit., *Appendix*, p. 571; TRAVERS's *Inquiry*, p. 320; SCARPA, *mem.* iv. § iv. Case of Congenital Hernia, also § xix. Case of DOMINICO PAOLI.

* *Mem.* iv.

portion of the gut by the adhesive inflammation which precedes the separation of the strictured and mortified part. This adhesion prevents the passage of the intestinal contents into the abdomen, when the slough separates or is divided, and forms a membranous cavity, embracing the two ends of the bowel, by which those contents are conveyed to the external wound. As the lower part of this membranous cavity, which is connected to the wound, contracts in the progress of the cure, the passage of the feces through it is rendered more and more difficult, and they take their course into the lower orifice of the intestine, always open to receive them. Hence we clearly understand how pressure on the external wound always assists the passage of the feces towards the anus; and how, when the external wound is very open, such pressure is absolutely necessary for that purpose. As the cure proceeds, the intestine is gradually retracted towards the abdomen, and draws with it the membranous cavity, elongating it into a kind of funnel-shaped process, of which the upper broad end embraces the orifices of the bowel, while the inferior much narrower portion is continued through the ring, and often terminates externally by a small fistulous orifice. The two ends of the bowel are united at an acute angle in the mouth of the sac; and a projecting ridge is formed at the point of union, which prevents the direct passage from one extremity to the other. When a portion of the whole cylinder has been lost, the two apertures touch each other only by a small part of their circumference; the projecting ridge is considerable, the angle of union acute, and the membranous funnel is not adequate to restore the canal until the ends have been considerably retracted within the abdomen. When a portion only of the diameter has been destroyed, all these circumstances are more favourable.

In a young man, on whom he operated for mortified congenital hernia of the left side, a large loop of ileum was removed, and great relief obtained by the consequent escape of fecal matter. On the forty-second day, after some fluctuation in the alvine discharge from accidental causes, the cicatrix was complete, except that a few drops of fecal fluid escaped at long intervals, and he left the hospital. In the following year he died of a violent intestinal attack, consequent on repeated irregularities in diet, and particularly after having eaten voraciously of crawfish, not well cleansed from the shells and claws. The ileum was found ruptured

just above the point of its adhesion to the peritoneum, and much yellowish fluid had escaped by the aperture, in which several portions of shell were engaged. The intestine between the stomach and the groin was distended to three times its natural size; while the inferior part of the canal was much contracted. The two ends of the gut, meeting at an acute angle, were firmly united behind the inguinal ring. "I found," says SCARPA, "that the great sac of the peritoneum had not only become firmly adherent to the portion of the intestinal tube, which had been unaffected by the gangrene behind the inguinal ring, and, properly speaking, in the cavity of the abdomen; but likewise, that this sac of the peritoneum, like a membranous funnel (*imbuto membranoso*,) extended from the cavity of the abdomen, through the inguinal ring, into the fistulous tube, communicating externally by a narrow hole in the groin." "Having divided longitudinally the narrow fistulous canal and the membranous funnel, I saw distinctly, that the two orifices of the intestine had remained parallel, without being at all turned towards each other; and a ridge (*promontorio*) projected between them, which would have been sufficient of itself to prevent the direct passage of the feces from the superior into the inferior orifice. The alimentary matters must therefore have been poured from the upper end into the membranous funnel, and have passed thence, by a half circle, into the lower end of the intestine. And it was precisely in this half circle that the shells of the craw-fish had accumulated, so as to obstruct the communication, and occasion the rupture of the intestine."*

In a second case, of a patient who died some years after recovery from a mortified crural hernia, of which nothing remained but a very small fistulous opening, now and then giving issue to a few drops of fluid, there was reason to suppose that a part only of the diameter had been included; and consequently the angle of union, although strongly enough marked, was not so acute as in the preceding instance. This part was surrounded by a membranous funnel formed by the neck of the hernial sac; but it had been drawn with the intestine into the abdomen, so that, at the time of death, it was several lines above the crural arch. The upper portion of the intestinal canal was much larger than the lower. SCARPA injected water into the former, and expected to see it pass readily into the latter, remem-

* Sect. iv. and v.

bering that the whole diameter had not been intercepted, and that, during life, the intestinal contents had freely pursued the natural course. The fluid, however, met with an obstacle when it arrived at the point where the two portions of intestine were united; and could only pass from the upper to the lower orifice by traversing the membranous funnel, in which it described a semicircle behind the crural arch, causing slight oscillatory motions, that were communicated even to the integuments of the groin. The peritoneum formed the membranous funnel, the basis of which inclosed the angle of union of the two ends of the intestine, while the apex passed under the tendon, and terminated at the small fistulous aperture. On slitting open the gut, its orifices, separated by a small eminence formed between them, were found side by side. This eminence, although not so considerable as that observed in the preceding case, and not entirely stopping the direct communication of the two ends, was sufficient to occasion even water, when injected into the gut above, to pass from it into the membranous funnel, and thence into the lower orifice of the intestine.*

The following observations of the BARON DUPUYTREN not only point out the mode in which the natural course of the contents is restored after the bowel has been opened by mortification or wounds, but show that the canal can be so completely re-established, as to leave hardly a trace of the previous mischief, and thus afford strong confirmation of the opinions and doctrine maintained by PETIT, RICHTER, and SCARPA.

“When the intestine has been simply opened, or if it has lost only one-fourth, one-third, or half its diameter, nature sometimes accomplishes effectually the cure of the artificial anus. In passing over the ridge, which in such cases is

* SCARPA, mem. iv. sec. vi.; See also plate xi. for a representation of the facts. Cases of hernia with mortification, which have recovered, and been afterwards examined, are described in the following works. In the angular junction of the two ends of the intestine, in their firm adhesion to the peritoneum lining the parietes, and in the narrowing of the tube, most of these accounts agree with the representations of SCARPA. See *Giornale di Medicina*, tom. vi. *Hist. de la Soc. Roy. de Medecine*; tom. iv. p. 321. The account is accompanied by two figures. The passages cited from the works of DE HAEN and MAUCHART in the note at page 370. MORAND *sur la réunion des deux bouts d'un intestin, une certaine portion du canal étant détruite*; in the *Mém. de l'Acad. des Sciences*, année 1735. PIPELET, *sur la réunion de l'intestin, qui a souffert déperdition de substance dans une hernie avec gangrene*; in the *Mém. de l'Acad. de Chirurgie*; tom. iv. p. 164; with two figures. A case in which the colon had united after a gun-shot wound, was examined by AMYAND, and exhibited similar appearances. *Philos. Transact.* vol. xxxix. p. 336.

obtuse, the contents of the bowel act upon it and generally diminish its prominence, pushing it back with a force proportioned to the resistance which they experience to their escape through the narrow wound in the abdomen. The peristaltic movements, the more or less considerable efforts of the two ends of the intestine, and the undulations of the entire canal, equally contribute to loosen and elongate the adhesions which connect the opened part of the intestine to the surface of the cavity.

“ A third circumstance, of greater influence, co-operates with the two preceding. The mesentery, corresponding to the affected portion of the intestine, is stretched and forms folds between its lumbar attachment and the bowel. In many herniæ the mesentery experiences considerable extension, so that when the protruded parts are adherent to the bottom of the sac, it forms a cord directed in the course of the vertebral column, which keeps the body bent forwards and prevents it from being carried backwards. In the artificial anus, this mesenteric cord is constantly drawing the intestine towards the cavity, dragging it away from the part to which it is adherent, and thus tending to restore it to its originally loose and movable condition. We can thus imagine that the horizontal position of the trunk, or still more the bending it backwards, may favour the spontaneous cure of artificial anus. This retraction of the mesentery and dragging of the intestine from the parts to which it had become united are not however free from danger. We have seen from this cause laceration of the adhesions connecting the ends of the intestine and consequent fatal effusion into the abdomen.

“ The usual effect of these causes is to separate gradually the opened part of the bowel from the parietes of the cavity, and to restore its natural mobility. In proportion as this change proceeds, the funnel-shaped cavity which separates the ridge from the external opening of the artificial anus is extended. Thus the intestinal contents find, in front of the ridge formed by the curvature of the intestine, a space becoming larger and larger, through which they have a readier passage from one extremity to the other. They are directed with less force towards the external opening, and thus allow the wound of the integuments to contract and close. Thus the funnel-shaped cavity, or the membranous funnel, as SCARPA calls it, becomes gradually elongated : at the intestine, it maintains a diameter equal to

that of the opening in the canal, while its apex, at the wall of the abdomen, contracts in proportion to its distance from the basis. After a time, this narrow portion allows no passage except to liquid fecal matter or mucous fluid; and subsequently it closes entirely. The external wound now closes, and the cure is complete. M. WEDEMEYER of Hanover has published a curious case of artificial anus at the bend of the thigh in a female, which became closed spontaneously during utero-gestation, after all means of cure had been tried in vain. As the uterus ascended into the abdomen, the escape of matters from the accidental opening diminished, and there was a corresponding increase of natural motions. During the latter months nothing flowed from the crural aperture but a little serous fluid and pus: in one month after parturition, and seventeen months from the commencement of the affection, the artificial anus had completely closed. In this case, the uterus in its ascent must have carried upwards the opened portion of the intestine, and have elongated the membranous funnel, so as to allow the natural course of the intestinal contents to be re-established.

“ We have had the opportunity of examining at the Hôtel Dieu the bodies of several patients many years after they had recovered by the mere powers of nature from the disgusting malady now under consideration. We have found the intestine, not attached to the parietes as might have been expected, but loose in the cavity. A fibro-cellular cord, extending from the cicatrised portion of the abdominal parietes to the intestine, constituted the last vestige of the adhesions which had formerly united them. This cord, some inches in length, thicker at its extremities than in the middle, and covered by the peritoneum, was solid, and composed internally of dense and firm cellular tissue.”

The experiments performed on animals have not succeeded in showing the process of restoration followed by nature in mortified hernia, because the essential circumstance, the peritoneal sac, cannot be produced artificially. Mr. TRAVERS's researches, however, have disclosed to us the unexpected and interesting facts, that nature can easily restore the canal in a dog, when it has been interrupted by a ligature encircling its whole circumference, or when a fold is firmly tied, and the strangulated piece cut off below the thread.* The gut becomes adherent to the surrounding

* *Inquiry into the Process of Nature, &c.* pp. 98 and 342.

peritoneal surfaces: coagulating lymph is effused over the ligature, which, by itself in the one case, and in the other with the included portions of intestine, is separated into the canal. The ends of the bowel, divided by the ligature, are retained in apposition by the effused lymph, which, becoming organized, unites them firmly, so that very little appearance of the operation remains externally.

Almost all the numerous instances of recovery from mortified hernia, which are recorded in the annals of surgery, took place where the surgeon was contented to remain a quiet spectator of the process, merely providing for the discharge of the intestinal contents, without interfering with any artificial means of uniting the divided intestine.* The following cases, translated from PETIT and SCARPA, exhibit the proper method of treating these complaints.

CASE I.—“As I was travelling post in Germany, I went, while the horses were being changed, into a room, where I perceived an insupportable stench, which I immediately recognized, although it was mingled with several others no less disagreeable. It was a smell of putrefaction or gangrene that I particularly distinguished: and, on inquiring the cause, a female attendant led me to the bedside of an apparently dying man. The groin and scrotum were in a state of gangrene, and perforated by several openings, giving issue to feces mixed with bile, and containing white clots, which consisted of curdled milk: forming a medley highly offensive both to the sight and smell. Having removed the filth, cut away the sphacelated skin and membranes, and discovered the spot at which the in-

* PETIT *Traité des Maladies Chirurgicales*; tom. ii. p. 317 et 399; *Supplément au Traité de PETIT*, p. 116; POTT'S *Works*, vol. iii. p. 319; AMYAND in the *Philos. Transact.* vol. xxxix. pp. 338 and 341; *Hist. de la Soc. Roy. de Médecine*, tom. iv. p. 321; *Mémoires de l'Académie de Chirurgie*, tom. i. p. 603; tom. iii. pp. 178 et 181; *Mémoires de l'Acad. des Sciences*, année 1723, p. 30; année 1735, p. 249; MAUCHART, *Dissert. Chirurg. de Epiploenterocece crurali incarceratâ sphacelatâ, &c.* in HALLER'S *Disput. Chirurg.* tom. iii.; HEISTER de *Herniâ incarceratâ suppurata sæpe non lethali*; *ibid*; *Recueil Périodique, or Journal de Médecine, Chirurgie, &c.* tom. iv. p. 48; tom. vii. p. 53, 124; tom. xxiii. p. 274; tom. xxxvi. p. 68; DE HAEN *Rat. Medendi*, p. 7. c. iv.; WILMER'S *Practical Obs. on Hernia*, p. 82, &c.; GOOCH'S *Surgery*, vol. ii. p. 197 and 203; COOPER on *Inguinal Hernia*, p. 33; and in the Appendix to Mr. HEY'S *Practical Observations*, p. 571.

I have only to remark, that in almost all the instances, recorded in the works now quoted, two or three inches, or still longer portions of the intestinal canal had been destroyed by the mortification; and they all recovered completely. The number of citations might be increased; but these are sufficient to illustrate the principle.

testine had opened, I procured, by the introduction of a canula, the discharge of much liquid bilious matter from the canal above the stricture. The protruded portion of bowel adhered every where to the surrounding parts, especially about the ring. I added nothing as an external application to the species of suppurative, which had been already employed; and trusted the rest of the business to nature. Having left directions for the future management of the patient, I promised a visit on my return, to learn the event. I passed through this village, in my way to France, five months after, and found my patient, who had recovered in twenty-eight days, without any fistula, in perfect health."

CASE II.—"On another occasion, as I was going by night to La Ferté-sous-Jouarre, the postilion lost his way. Perceiving a light in a neighbouring hamlet, I went to the house of a peasant, to inquire the road, and found his wife on the point of death from an intestinal hernia, which had burst in the sac, and had given issue to a large quantity of fecal matter. Thus at least I inferred from the narrative of the attendant, who informed me, that the swelling had increased in size all at once, and that they had heard at the same time a noise as of water and wind. Being much pressed for time, I contented myself with simply opening the sac, and the bed was immediately inundated with fecal matter: the discharge being at least eight times as much as the tumour could possibly have contained. The patient was greatly relieved, and the belly subsided: I applied to the part nothing more than cloths dipped in a decoction of the herbs used for clysters, of which they had fortunately an abundant provision, directing that the application should be frequently renewed, and that they should be careful in keeping the patient clean.

The husband recompensed my services by conducting the postilion to Jouarre; and I promised to see his wife the next day on my return, but I was unfortunately detained twenty days. The poor man, impatient at my delay, came, on the fifth day, to inform me that his wife continued well, and felt no pain; but that all her stools were discharged through the wound which I had made, and that he knew not with what balm he ought to dress her; he stated further, that the wound, when wiped, appeared clean, but that it was rendered foul by the discharge several times in the day. I recommended a continuation of the same plan,

that of applying cloths moistened in the emollient decoction. In six days he again came to La Ferté and informed me, that his wife had been to stool in the natural way, that the discharge through the wound was very slight, but that she felt excessively hungry: I allowed her a little more soup, and directed a continuation of the same applications. He visited me on the fifteenth day with the intelligence that his wife grew better and better, and that she would not be restrained from satisfying her appetite: the discharge through the wound was in very small quantity, and took place only when she strained in expelling the feces. I ordered a clyster, whenever she felt any inclination to go to stool, in order to dilute the feces, and recommended that she should exert herself as little as possible in their evacuation. On the twenty-second day I set off on my return to Paris, and found the external wound very nearly healed: the opening in the intestine had, in all probability, entirely closed, as no feces had appeared through it for three days. After the expiration of a month I again saw her in Paris, in a state of perfect health: I recommended a truss, in order to prevent any return of the protrusion, which, however, I do not fear so much in cases like the present, as in others.”*

CASE III.—In a case of scrotal hernia, where the mortification had proceeded to considerable extent, “I performed the operation, after explaining to the relations how much reason there was to fear a fatal event. The exposure of the intestine and omentum was attended with no pain: the former, which consisted of ileum, had not given way, although the strangulation was of nine days’ standing. After a short deliberation, I determined to make an opening of an inch in length in the mortified intestine, and fixed on the middle of the protruded part for the situation of the incision. A copious discharge ensued, from which the patient experienced great relief. I terminated the operation here, not thinking it advisable to dilate the ring, when there were no sound parts to be returned, and the contents of the intestines were discharged with facility; and covered the parts with cloths dipped in the emollient decoction. At the end of five hours the tumefaction had nearly subsided: the patient passed an easy night, and the discharge through the wound was inconsiderable, probably because

* *Tr. des Mal. Chir.* tom. ii. p. 317—321.

the stomach and intestines were already completely emptied. On the second day a manifest line of separation appeared between the living and dead portions, which induced me to remove a considerable quantity of the latter. I still left a part, under the idea that it might retain the ends of the sound gut out of the abdomen, and afford an opportunity of attaching ligatures with the same object; for I had hitherto not perceived that the sound portion had contracted any adhesion to the ring. Suppuration commenced on the fourth day; and the ends of the intestine, attached by the ligatures, began to separate: but, as I found that the gut adhered slightly to the ring, and as it had kept its place, since the operation, without any disposition to withdraw into the abdomen, I made no change in the manner of dressing. The mortified ends of the intestine came away on the fifth and sixth days, and the omentum separated in two days afterwards: the whole wound now looked red and healthy, and granulations appeared on the protruded parts, continuous with those formed in the neighbourhood of the ring, and by the integuments. The treatment was still confined simply to cleaning away the discharge, and applying cloths dipped in the emollient decoction. As the patient was weakened by the severe regimen, I added the yolk of an egg to his jelly; on the fifteenth, I increased the quantity of the latter, and allowed another yolk, giving him leave also, when thirsty, to take a few spoonfuls of decoction of *dogs-tooth* (dogs-grass, couch-grass.) Hitherto nothing had passed into the intestines below the hernia, and I ventured to give him half a clyster, which he retained. As he felt some rumbling in the bowels on the next day, I ordered a whole clyster of the emollient decoction, with two spoonfuls of oil: this came away at the end of six hours, with some hard balls of fecal matter, which must probably have remained in the large intestines since the commencement of the strangulation. On the following days he only took half clysters, which being retained, I gave him another whole one: this brought away some scybala, together with much bile; and hence I concluded that something had passed through the small into the large intestines; that the divided ends were beginning to unite, and thereby re-establish the natural course of the feces. From this time I had the satisfaction to observe a daily diminution in the quantity of fecal matter discharged through the wound, and to perceive that the half clysters,

which were still continued, facilitated the evacuation per anum.*

CASE IV.†—"DOMINICO PAOLI, twenty-five years of age, was operated on by me for a gangrened scrotal hernia of the left side. As soon as I had made an incision into the lower mortified part of the small intestine, and removed the immediate cause of the strangulation, a great quantity of fluid matter was discharged from the wound, followed by several lumbrici, with great relief to the patient. On the gangrened parts being separated by the efforts of nature, the orifices of the divided intestine and the neck of the hernial sac retired beyond the inguinal ring, and the cure went on daily very favourably. After some weeks the feces resumed their natural course, the wound contracted, and only transmitted at long intervals a very little thin, yellowish, feculent matter, through a small opening in the centre; in which state the patient left the hospital. He remained very well for three years; for neither the labours of the country, nor the coarse diet, caused any considerable pains in his belly, nor retarded the alvine excretions."

In support of the practice here recommended, I can adduce the opinions of three celebrated men, whose acknowledged abilities and extensive experience entitle them to the greatest attention. It will be sufficient to mention the names of J. L. PETIT, RICHTER, and SCARPA.

After mentioning a valuable and instructive case, PETIT proceeds, "Cette observation, et quelques autres, que j'ai rapportées ci-dessus, prouvent bien que les guerisons, qui paroissent miraculeuses, sont dûes à la nature plus qu'à l'art. Heureux les malades qui tombent entre les mains des chirurgiens bien convaincus de cette vérité: ceux ci s'attacheront seulement à éloigner tout ce qu'ils croiront pouvoir troubler ou interrompre la nature dans ses fonctions, et n'en auront pas moins de gloire."‡

There can be no doubt," says RICHTER, in his Elements of Surgery, "that the surgeon acts most prudently in leaving the union of a divided intestine entirely to nature; and that all the artificial methods, which have been hitherto recommended, are much better calculated to disturb, than to aid, her salutary operations."§

* *Traité des Mal. Chir.* tom. ii. p. 358—359.

† SCARPA by WISHART, p. 339.

‡ *Traité des Mal. Chir.* tom. ii. p. 403, 404.

§ *Anfangsgründe der Wundarzneykunst*, vol. v. p. 346.

SCARPA* observes, " We see almost daily, that nature, by her own powers, and with wonderful simplicity, effects mildly such sort of cures, preparing herself, to use the expression, for the process, by making the adhesion of the sound portion of the intestine to the neck of the hernial sac precede the gangrene of the strangulated intestine; then, on the separation of the gangrened parts, by retracting towards the cavity of the abdomen the divided extremities of the intestine, together with the remains of the neck of the hernial sac, by means of this membranous funnel it at first directs the feculent matter by the wound, then forms of it a passage or depôt, within which the feculent matter, poured from the superior orifice of the intestine, making a half circle, passes into its lower aperture. For two or three cases of the fortunate event of RAMDOHR'S operation, there are now innumerable cases recorded of complete cures effected by nature, without the intervention of art; on which account, at the present day, those patients may be considered fortunate, who, in such very urgent circumstances, fall into the hands of surgeons who have not the mania of operating, and are not too anxious to close the fecal fistula."

A few observations only are necessary on the general management of patients labouring under mortified herniæ. The urgent necessity of relieving the distended and inflamed intestinal canal, the utility of mild purgatives and clysters, and the propriety of a strict attention to diet, have been already pointed out. The latter should not be particularly small in quantity; but soft, easily digestible, and nutritious. The powers of the patient are sometimes so reduced by the disease, that he requires to be supported by the most nourishing kind of food; here strong soups and broths, eggs, milk, farinaceous substances, and even wine may be necessary. Bark and cordial medicines may be combined with these. A common poultice, with occasional fomentations, constitutes the best local application; the necessary attention to cleanliness requires that it should be often renewed. When the sloughs have separated, and the dimensions of the wound have diminished, its entire closure may be favoured by approximating the edges with sticking plaster, and making pressure on the part.

If an opening should unfortunately be made in the in-

* English translation of Mr. WISHART, p. 353.

testine, in consequence of a rupture being mistaken for a bubo, the treatment will be the same as when the gut has mortified. "I was lately concerned," says GOOCH,* "for an elderly man, who had a bubonocoele inadvertently opened for an abscess, and who, by such kind of treatment as advised in the preceding case, (a hernia with gangrene of the intestine, recovered by laxative medicines and clysters, with a restriction to liquid food,) was completely cured. And many years ago I was an eye witness to such a happy event, or accidental cure, in an old woman who had a femoral hernia incautiously opened just beneath POUPART'S ligament."

Worms have been discharged, in several cases, through abscesses, from the intestines contained in ruptures. The surgical treatment would be the same here as where the bowels are perforated in consequence of mortification.

The patient, who has recovered from a mortified hernia, with the natural passage of the feces restored, still remains exposed to considerable danger from disorder of the bowels. The dimensions of the intestinal canal are almost always diminished, sometimes considerably so, at the part affected; and the transmission of the contents experiences a further obstacle from the projecting ridge formed at the angle of union between the ends of the gut. Hence the strictest attention is necessary to the quality and quantity of food, and to the regular evacuation of its fecal residue.

In a case recorded by Mr. A. BURNS, of crural hernia, which occurred during parturition, proceeded to mortification with external discharge of the intestinal contents, and then slowly but completely healed in the course of two months, the patient subsequently died of inflammation of the bowels. Examination disclosed, besides the usual appearances of peritonitis, the following circumstances. "Above the middle of the ilion, the canal of the gut was much enlarged, and the coats of the intestine were considerably thickened. Below this point, the diameter of the gut was much reduced. Between the dilated and contracted parts of the gut, a portion of the ilion had protruded through the left crural foramen, along with a portion of thickened omentum, which lay behind the intestine. The whole diameter of the gut was not displaced; about four-fifths of it, however, were protruded: hence the direct

* *Works*, t. ii. p. 202. See also *Mem. de l'Acad. de Chir.* tom. iii. p. 173; and tom. v. p. 597.

passage, from the part of the intestine above the protrusion into the part below it, was not larger than the diameter of a goose-quill. Just in contact with the herniated portion of the gut, the upper end was ruptured. Through this vent, which was a few lines in length, the feculent matter, which was found in the pelvis, had escaped.”*

Direct obstruction from hard, indigestible, and unwholesome food has caused the cicatrix to give way, and thus renewed the discharge of feces from the wound; the same effect has arisen from indigestion or costiveness.

A patient had completely recovered from mortification of the bowel, when an obstruction took place, which caused the cicatrix to give way. The natural passage was soon re-established.† A similar case will be found in the *Journal de CORVISART*, &c. tom. xxv. p. 169. Another person, whose case is recorded in the *Histoire de la Société Royale de Médecine*,‡ survived the operation eight years. During this time the cicatrix gave way and closed again many times. The last attack of this kind was fatal. The gut has been known to burst at the point of union, long after the complete recovery, and death has been the consequence.

The patient, on whom LA PEYRONIE first tried his method, was subject after his recovery to a colic, of which he died.§ In the second case, where the opening closed at the end of four months, an abscess formed afterwards under the cicatrix, and discharged some fluid fecal matter, and a small bone. This healed in two months; but the man was afterwards subject to colic.|| A third patient of the same surgeon, after losing two inches of intestine, had completely recovered at the end of a month, chiefly, as it should appear, by means of a very strict regimen. In two months some attacks of colic were experienced; the last and most severe of which was accompanied by violent vomiting. Acute pain was felt at the cicatrix; the abdomen swelled, and became painful, and death followed on the second day. Examination showed, that the intestine had burst, and given issue to fecal matter, which filled the abdomen.¶ A

* MONRO, *Morbid Anat. of the Gullet*, &c. p. 399.

† *Recueil Periodique*, or *Journal de Médecine*, &c. tom. vi. p. 48. A similar case will be found in the *Journal de CORVISART*, tom. xxv. p. 169.

‡ Tom. iv. p. 321.

§ *Académie des Sciences*, année 1723.

|| *Mémoires de l'Acad. de Chir.* tom. i. p. 341.

¶ *Ibid.* p. 343.

similar example is related in the 3d volume of the same work;* and another by MORAND in the *Académie des Sciences*, an. 1735. RICHTER saw a patient die suddenly a few weeks after the cure of a mortified hernia. The intestine was detached from the peritoneum, and perforated by a round hole; the abdomen being filled with effused alimentary substance.†

A patient of SCARPA's died a year after his recovery from mortified hernia, in consequence of eating a large quantity of cray-fish. The gut burst from an obstruction of the part. The case is related in the present section, p. 365.

In a case of crural hernia related by PELLETAN, obstruction took place from indigestion: a tumour formed and burst, and the fistula afterwards closed.‡

In another case (of crural hernia with mortification) the natural course of the feces was never re-established. It was nearly restored, when indulgence in eating brought on obstruction, which was overcome. By rigorous diet, and other measures, the issue of feces was again lessened; but a second indulgence produced a fatal obstruction. The adhesion of the gut gave way, and the matters were effused into the abdomen.§

A patient, under these circumstances, might perhaps be relieved, if the surgeon were bold enough to undertake a hazardous operation. It would be right to cut down on the part, and freely open the membranous funnel, which unites the ends of the intestine. This is the spot in which the obstruction occurs. In a person who had recovered from a mortified hernia, the feces ceased to pass per anum; nor could any stools be procured: the belly became distended. The surgeon made an incision into what he calls the distended intestine, which must have been the membranous cavity connecting the two ends of the bowel: he was thus enabled to introduce his finger and extract a hard substance, formed on a nucleus of a plumstone, with kernels and skin of apples. The patient was greatly relieved and soon recovered.||

* P. 163.

† *Traité des Hernies*, p. 153.

‡ *Clinique chirurgicale*, tom. iii. p. 60.

§ *Ibid.* p. 94.

|| *Journal de Médecine, Chirurgie, Pharmacie*, &c. de M. LE ROUX, for June, 1787, tom. lxxi. p. 547. The case is annexed by the French translator of RICHTER to the *Traité des Hernies*, p. 306; and it will also be found in SCARPA, Mem. 4, § 20; and in BOYER, *Traité des Mal. Chir.* tom. viii. p. 179.

SECTION V.—ARTIFICIAL ANUS; *anus contre nature*;
anus anormal or accidentel.

An artificial anus is a preternatural opening through the abdominal parietes, communicating with the intestinal canal, and giving passage to the contents of the intestines, either wholly or in great part. It generally results from a loss of substance consequent on mortification of the bowel in strangulated hernia; but it may be the consequence of penetrating wounds, or of ulceration of the canal from internal or external causes.

The sides of the opening in the intestine become united to the circumference of the aperture in the abdominal parietes, and this union is rendered firm by the process of cicatrization. Thus an effectual barrier is opposed to the effusion of the intestinal contents into the abdomen. If the process of restoration described in the two preceding sections, should not be completed, in consequence of the ends of the gut being united at too acute an angle, not being properly situated with respect to each other, or not sufficiently retracted towards the abdomen to allow the contents to pass from one to the other through the membranous funnel, the feces must find their way through the wound, which is thus established as a permanent artificial anus. Hence the essential circumstances of the case consist in an abnormal fistulous opening, formed in the intestine and the abdominal parietes closely united together, and affording a ready discharge to the intestinal contents; and in an obstacle, which prevents those contents from following their natural course.

Description.—The artificial anus, however it may have been produced, presents an opening, mostly rounded, sometimes irregular, and varying in diameter from a few lines to an inch or more. The margin is generally thick and depressed, inclined towards the abdomen and adherent to the subjacent parts: it is continuous with the mucous membrane of the intestine, a reddish line marking the point of union. The surrounding integuments are more or less puckered, and usually inflamed or excoriated from the irritation of the intestinal discharges.

BARON DUPUYTREN has seen a portion of bowel, which

had been left in the wound and had given way at several points, covered by a reddish cicatrix, and constituting a tumour from which liquid fecal matter escaped at many openings.*

If the intestinal contents have become effused under the integuments, fistulous openings may exist, communicating with the principal aperture; and inflammatory thickening of the integuments and subjacent textures, or callous enlargement may be produced by the same cause. At the entry of the artificial anus we frequently see some portion of the intestinal mucous membrane, which is bright red and swollen.

The adhesions, which unite the intestine to the opening in the abdominal parietes are formed by coagulating lymph effused from the opposed serous surfaces; at first soft and gelatinous; subsequently organised so as to constitute a firm union. A few hours suffice for its effusion, and even for the production of vessels in it: some days are necessary to give it solidity. The adhesions commence on the serous surfaces, and then extend to the other coats of the intestine, and to the various structures which make up the abdominal parietes; the union of the parts last mentioned being ultimately rendered firm by cicatrisation.

The abdominal cavity is protected at the margin of the opening by a feeble barrier: the extent of the adhesions being only from half a line to a line; sometimes, but rarely, reaching to half an inch.

In herniæ, the formation of the adhesions generally precedes the death of the part; while in wounds they must be established subsequently to the opening in the intestine. Hence the greater frequency of fatal effusion from the intestine in the latter case.

Examining the parts from within, we see the intestine, which has suffered the loss of substance, approach the surface of the abdomen; it becomes fixed, by firm adhesion, to a greater or less extent, and then pursues its course in the cavity. The upper and lower portions of the bowel pass from behind the artificial anus into the interior of the abdomen, sometimes crossing, sometimes running parallel, sometimes separating at a more or less acute angle. The peritoneal covering of the intestine is continuous, at

* *Dictionnaire de médecine et de chirurgie pratiques*; art. *anus anormal*, tom. iii. p. 129.

the point of adhesion, with that lining the parietes; and the mucous membrane is continued into the smooth surface of the external aperture.

An interval is left between the two ends of the bowel, as they recede from the artificial anus, which constitutes a kind of cul-de-sac, communicating with the abdomen at its entrance, and terminating at the opposite end where the intestine is connected to the parietes. The loose contents of the abdomen may pass into this space, and being resisted only by the cicatrix, may protrude it and cause a hernia through the abnormal aperture.

Between the opening in the integuments and the loss of substance in the intestine, there is generally a more or less considerable interval occupied by the membranous funnel described by SCARPA, consisting of the neck of the hernial sac and other surrounding parts condensed into a compact membranous texture, and presenting internally the same kind of smooth villous surface which we find in fistula. The form, size, length, and direction of this funnel vary greatly. In proportion as it is longer and larger, the chance of natural cure is greater, and our surgical treatment is more likely to have a beneficial result. In some cases this membranous funnel is wanting; the gut adheres immediately to the opening in the integuments. This is the case in artificial anus caused by wounds in the abdomen, and sometimes in those following herniæ. There is no chance of natural cure under such circumstances; the only hope is in the operation which will be subsequently described.

“ In the bottom of this funnel,” says DUPUYTREN, “ we find the most important and remarkable arrangements of the artificial anus. The two ends of the intestine, and the partition separating them are seen there. One of these orifices belongs to the upper part of the bowel; being constantly permeated by the food and feces, it is the largest and freest of the two. The other, or the opening of the lower intestinal extremity, receives no alimentary or fecal matter, or only a small quantity; it is contracted, narrow, and difficult to discover. Beyond these orifices are the two extremities of the intestine, of which they constitute the termination; these pass back into the abdomen, in the manner already described, and are lost among the convolutions of the canal.

“ Between the two orifices, and more or less near to the

entry of the funnel, an angular fold of greater or less projection is placed edgeways. This part, already observed and indicated by SAVIARD and MORAND, is formed by the contact and union at an acute angle of the two portions of intestine which end at the artificial anus. Formed by the intestinal coats towards the mesentery, where they have escaped the action of gangrene or wound, this ridge comes nearer to the skin, in proportion as the loss of intestinal substance has been more considerable, and the change in the direction of the canal more marked. It is slight, and concealed in the depth of the funnel, when the intestine has been simply opened by a wound or a small mortification, and passes in its natural curve along the posterior surface of the abdominal wall. It is very large, and advances to the level of the skin, when the whole circumference of the bowel has been destroyed, so that the two ends meet at an acute angle, and more especially if they are parallel. In the first case, there exists between the two ends of the bowel a channel more or less deep, capable of conveying the contents from the upper to the lower end: this is the kind of artificial anus most easily cured. There is no vestige of such channel in the second instance; the projecting ridge placed between the two ends of the intestine, forms an impassable barrier between them: here the cure is more difficult.

“The ridge or spur, (*éperon*,) although placed between the two ends of the bowel, does not divide the bottom of the funnel equally; or, if this should be the case at first, the division becomes unequal subsequently. Being fleshy and movable, it is turned aside by the stream of matters coming through the end corresponding to the stomach, and pushed towards the anal extremity, contracting it, and acting as a kind of valve, which sometimes entirely shuts it. Hence the difficulty so often experienced in discovering the lower or anal orifice of the bowel.

“The ridge, examined from the intestine, is crescent-shaped, the horns being directed from the concavity towards the convexity of the tube, and gradually lost on the surface of the bowel, or on the margin of the artificial anus. When we view this part from the abdomen, we see that it is composed of two layers, separated behind, and receiving the mesentery in their interval. This division of the ridge at its basis results from the mechanism of its formation. Produced by the contact at a more or

less acute angle of the two halves of an intestinal convolution, it consists of a single layer at its concave or sharp edge; elsewhere it is made up of two layers, leaving between them a triangular interval, which becomes gradually wider as the two portions of intestine separate from each other behind.”*

Thus the two portions of the bowel lie near together, but are not adherent; they are separated by the ridge, called by SCARPA *promontorio*, and by the French *éperon*. If we introduce a finger into each orifice, and bring the fingers together, they are separated merely by the sides of the two portions of intestine. When it is described that they are kept apart by an intervening partition, we must remember that there is nothing but the intestinal tunics. We might pass an instrument from one end of the bowel into the other, and thus cause a direct communication between them by perforating the coats; but as the bowels are simply contiguous without adhering, we should make a double wound into the cavity of the abdomen.

The two ends of the intestine, at first similar in size and appearance, soon exhibit striking differences. The superior not only retains its natural size, but becomes larger and stronger; its coats become thicker, and it seems to be the seat of a more active vitality. The lower portion, on the contrary, ceasing to exercise its functions, and no longer stimulated by the aliment or feces, shrinks, becomes thinner, and undergoes a kind of atrophy. The contrast after a few years is so striking, that the two portions of the canal might be supposed to belong to different individuals at different ages. The lower portion, however inactive and small it may become, still retains its tubular state. Its mucous membrane secretes a whitish viscid substance, which is occasionally voided per anum; which may be retained for a long time together in the canal, without acquiring fecal odour, or undergoing any other change. The inversion of the bowel at its lower end is a further proof that it still remains hollow. Dissection confirms these arguments: although the tube is greatly diminished, its cavity still exists. The following fact, however, observed by M. BEGIN, at the Val-de-grace, shows that the obliteration of the intestinal tube is not impossible. “In an old man of eighty,

* Mémoire sur une méthode nouvelle pour traiter les anus accidentels in the *Mém. de l'acad. royale de médecine*; tom. i. p. 264.

who had had for more than forty years in the left groin an artificial anus, formed on the transverse arch of the colon, which had been carried down to the inguinal region, the superior extremity of the bowel only opened at the wound. No opening corresponding to the lower extremity could be discovered, either in the cicatrix or the surrounding parts. The lower part of the bowel, in the form of a solid white cord, not larger than an ordinary pen, ascended to the left kidney, and then descended with some turns to the anus, increasing in size as it approached its termination. At the lower part it was still open, and contained whitish mucus; it was then contracted so as merely to admit a small probe; and in its ascending portion, for the length of six or eight inches, next to the preternatural opening, no trace of canal could be discovered.”*

Effects of the Artificial anus.—It may be expected that the function of assimilation will be disturbed, when the intestine deviates from its ordinary course, and is retained in an unnatural fixed position. The passage of the aliment is accelerated, and a greater or less portion of its course is entirely cut off. Hence digestion must be imperfect, and the associated functions of lacteal absorption and nutrition must be impaired in a corresponding degree. There is poured out through the artificial opening a mixture of digested matter, of substances still recognisable, and of aliment altogether unchanged, which under other circumstances would have undergone perfect assimilation, and have afforded the materials of healthy nutrition. Alimentary or fecal matters, mucous or bilious secretions escape constantly and involuntarily, according to the fulness of the canal, and the position of the new aperture. Sometimes the health of the patient suffers less than we should have expected. The action of the whole alimentary canal on the food is not essential to the continuance of life; and its different parts are not, in this point of view, of equal importance. The process of digestion in the stomach, the separation of the nutritive from the excrementitious parts, and the absorption of the former in the small intestine are indispensable; but the large intestine seems to be little more than a reservoir for the feces, and an excretory tube for their evacuation; and the cessation of its functions produces no material ill consequence. Hence the prospect of

* DUPUYTREN in the *dictionnaire de med. et chir. pratiques*, tom. iii. p. 133.

regaining and preserving health and strength, when the continuity of the intestine cannot be restored, depends entirely on the situation of the unnatural opening; is greater in proportion as that is nearer to the inferior end of the canal, and smaller as it approximates to the stomach.

When the new opening occurs near to the latter, the food is not submitted for a sufficiently long time to the action of the digestive organs, and it escapes in a half-assimilated state: nutrition must be performed incompletely, and we shall not be surprised at finding that the patient becomes thin and weak, and even that he perishes from inanition.* The matters voided in such cases are not fetid. If the fistulous aperture should be in the lower part of the ileum, in the cæcum or colon, the danger is much diminished. The patient can exercise all his functions, and with the exception of intestinal affections, to which he will probably be subject, his health and strength are not materially impaired. Here the evacuations are more fetid, as they have been longer retained.

In whatever part of the canal the artificial opening may be situated, the matters are discharged involuntarily, since there is no sphincter to retain them. Hence arise inflammation and itching of the surrounding parts, with painful excoriation, fissures, pustules, and ulcerations; with the most annoying inconvenience from escape of the intestinal contents and consequent offensive smell, from which the person and dress of the patient cannot be kept free. Lotions, ointments, mechanical contrivances, and compression, offer but an imperfect remedy in this painful and distressing state: the latter, indeed, in many cases cannot be borne.

An artificial anus does not always appear in the simple form now described. Prolapsus of the intestine takes place not unfrequently from the superior orifice, and sometimes from the inferior also. This subject will be considered in the following section.

A new hernia sometimes takes place, the adhesion of the intestine to the opening in the abdominal parietes being the only barrier to such a protrusion, while the resistance of the tendinous opening may have been diminished by the consequences of mortification.

Prognosis—It will be understood, from the preceding

* See the cases quoted in the third section of this chapter; p. 349.

section, that the event of cases, in which the intestine has mortified, can be little affected by direct surgical interference, except in making such openings as are necessary for relieving the distended canal; and that our efforts should be employed, as far as they can produce any effect at all, in favouring the restoration of the tube. We cannot prevent the formation of an artificial anus, although it is contrary to our intentions; yet, when the loss of substance in the canal cannot be completely remedied, the artificial opening is the only means of preserving life.

I have already noticed the different views of this subject taken by LITTRE and LOUIS. The former, after removing the gangrened part of the intestine, fixed its upper extremity to the wound by sutures, and tied the lower. This method is defended by the latter in his paper on the cure of herniæ with mortification, when the intestine is not adherent. He objects to the plan of LA PEYRONIE from the unfortunate cases, in which the intestine has given way after an apparently perfect cure; and considers that the disadvantages of an artificial anus have been overrated. The feces, he observes, must be voided somewhere, and the only difference is in situation. External compression will supply the place of a sphincter muscle, and retain the intestinal contents until their evacuation can be effected conveniently. This latter statement is not correct; the feces cannot be retained; and, however ingeniously the case may be palliated, it must still be regarded as one of the most distressing infirmities with which a person can be afflicted.

The establishment of an artificial anus must always be considered as a serious occurrence, entailing on the patient numerous painful consequences and distressing inconveniences, and sometimes leading inevitably to loss of life. Its effect on nutrition will be more serious, the nearer it is placed to the stomach, and in proportion to the quantity of the intestinal contents which it discharges. The degree in which it interferes with the process of assimilation is the most important point for consideration.

Where the opening is so situated, as to leave a sufficient length of the alimentary canal for the elaboration of the intestinal contents, the inconveniences of the complaint may be lessened by frequent ablutions and changes of dress, and by the employment of mechanical means for receiving the fecal

or other matters as they pass off, and retaining them. Measures of the latter kind will be more or less effectual according to the position of the preternatural opening.

Some cases admit either of complete or partial remedy by means of an operation, which will be described. The instances, in which the artificial anus has not been long established, and where consequently the lower portion of the intestine is not much contracted; those, in which both ends of the tube are easily met with, and the complaint exists in its simple form, are the most likely to be cured by operation.

Treatment.—The facts adduced in the preceding section show that when the opening in the intestine is small, a cure is often effected by natural processes without the interference of art. Many of these cases are fecal fistulæ rather than examples of artificial anus. Compression of the external opening by bandage or truss often assists in re-establishing the natural course of the aliment or feces.

This measure sometimes accomplishes the desired object, even where the loss of substance has been more considerable. A singular case of this kind is described by my late valued friend, Dr. CHESTON* of Gloucester; where the feces were not discharged through the wound, although there was an opening in the intestine. The latter part could be seen at the bottom of the wound, with its two ends at a distance from each other. The superior extremity propelled its contents towards the inferior, which absorbed them: and this process was carried on so perfectly, under the application of external pressure, which had the effect of completing the canal, that nothing escaped. The process, by which the canal is restored, and the injurious effects of suture of the intestine, are strikingly illustrated by this instructive case; of which further particulars will be found at p. 358.

If the case is not considered fit for an operation, or if the patient does not choose to submit to it, we must endeavour to alleviate the inconveniences, which arise from involuntary discharge of wind and feces through the new opening, by supplying the patient with an apparatus, in which they may be received, as they pass off. A receptacle of leather or horn, with its opening placed against the part, and connected to a strap going round the body, has

* See the first part of Sir A. COOPER's work, p. 36.

been generally employed.* JUVILLE† delineates a complicated apparatus, the construction of which appears more perfect than that of any contrivance previously described, while its steady pressure on the circumference of the artificial anus is calculated to prevent prolapsus of the intestine. An ordinary inguinal truss is made with an ivory pad, perforated in its middle, so as to fit the opening. A tube of elastic gum, furnished with a valve opening downwards, leads from this perforation to a receiver of silver, which is attached by a screw to the lower end of the tube, and lies against the inside of the thigh. The silver vessel may be unscrewed and emptied without disturbing the rest of the instrument. A large canula in the bowel, if its presence could be borne, might carry off the intestinal contents more perfectly: such an addition might be made to the instrument just described. It may probably be difficult to construct this instrument in such a manner as to prevent entirely the escape of fecal matter without producing inconvenient pressure. It seems to have answered well in one instance under the observation of SABATIER, to whom it was referred for examination by the Academy of Surgery. After it had been used for four months, by a patient at the Hôtel des Invalides, he gave a favourable certificate‡ of its effects in removing the inconveniences arising from the discharge of the feces, and enabling the patient to follow his ordinary occupations.

A common elastic truss, with a compress of linen under the pad, has been found in some instances more serviceable than any complicated instrument, in preventing the continual flow of feculent matter from the artificial opening;§ and the employment of a piece of sponge|| has been suggested with the same view: but it is hardly practicable to remedy this inconvenience altogether. It is desirable to keep up

* Such are described by FUNN, in the *Haarlem Transactions*, vol. i. ; and by LE BLANC, *précis d'opérations*, tom. ii. p. 460. In a case related by MOSCATI, where the new anus was under the right hypochondrium, the feces were received in a tin box from a leaden canula left permanently in the opening. *Mém. de l'Acad. de Chirurg.* tom. iii. p. 177.

† *Tr. des band. herniaires*, sect. viii. pl. vii. and viii. It is also described in RICHTER, *Tr. des H.* p. 169; and with figures in his *Anfangsgründe der Wundarzneikunst*, vol. v. § 427.

‡ This is seen in the work of JUVILLE quoted above.

§ *Parisian Journal*, vol. i. p. 193.

|| LOEFFLER found colic and constipation, with excoriation, produced by this treatment. The fluid retained by the sponge accounts for the latter circumstance. These symptoms ceased when the contents of the bowels were allowed to flow unrestrained. RICHTER; note d. p. 169.

constant pressure on the part, in order to prevent prolapsus of the bowel itself, or, what has frequently happened, a new hernia by the side of the former.

“The most effectual means,” says DESAULT,* “of preventing the eversion of the intestine, of keeping the opening sufficiently dilated, putting a stop to tenesmus, and retaining the intestinal contents long enough for the nourishment of the body, is to place in the opening a plug of linen, supported by a compress of lint, and a moderately tight bandage. In this method, the parts cannot be injured or bruised, and the contents of the bowel are retained. If a little fluid should escape, the lint will imbibe it. Some restraint is felt when this plan is first employed, and slight colic pain may be caused by it; but these effects speedily subside.”

Radical cure of the artificial anus. Method of DESAULT.—The course of proceeding now described is merely palliative. DESAULT attempted, and in one or two instances accomplished, a radical cure. He was aware of the angle formed by the two portions of the intestine, at the point of their division, and that it presents an obstacle to the passage of the intestinal contents greater in proportion as it is more acute. He endeavoured to remove this obstacle by introducing into the two ends of the bowel long tents, which at the same time dilate the inferior portion, and thus facilitate the passage of air or feces. If, in this way, the angular projection can be effaced, the two ends will so far correspond, that the alimentary matters will find a passage from the superior into the inferior. He placed, at the same time, a plug of linen in the artificial opening, to favour the passage of the feces in their natural course, and also to keep up the bowel, when, after having suffered prolapsus or invagination, it had been restored to its proper situation. As soon as the passage of natural stools indicated that the projecting angle was sufficiently reduced, he discontinued the long tents, and retained merely the linen plug, taking care that it should not penetrate too deeply. If this plan succeeds, its effects are indicated by the passage per anum, first of air, and then of feces; as the latter increases, the external opening will contract. The use of laxatives and clysters, and a strict regimen, will facilitate the cure. The following example, of artificial anus com-

* *Œuvres chirurg.* tom. ii. p. 362.

plicated with large prolapsus, in which DESAULT practised his method with complete success, is so interesting, that I insert the whole narrative.

“ FRANCIS VIALTER, a sailor, and native of Moulins, was wounded by the bursting of a bomb in the month of May, 1786. He became insensible, and continued in that state for three hours after the battle. The wound was on the right side, and extended from two inches above the abdominal ring to the bottom of the scrotum, where it had exposed the testicle. A portion of intestine, an inch in length, and divided, appeared at the upper part; and was withdrawn into the abdomen, during the washing of the wound. An opening was left in the dressings, in this situation, for the escape of the feces. He was received into the marine hospital at Brest, a month after the accident, and continued there until he was cured; if indeed that can be called a cure, which left him with a piece of intestine hanging out of the abdomen, and constantly discharging half-digested food.

“ In this miserable state he worked his way on foot to the place of his nativity. Finding that his friends could not furnish him with the means of subsistence, and that the exertions and fatigues of the journey had greatly elongated the protruded intestine, he visited, successively, the chief hospitals of Europe, in the vain hope of obtaining relief from his loathsome infirmity. After wandering about in this way for four years, he was received into the Hôtel Dieu, at Paris, on the 29th of September, 1790.

“ The protrusion had acquired a considerable bulk. Its form was nearly conical, and it measured nine inches in length: the middle and anterior part was very prominent. Its basis, rather contracted, appeared to proceed from beneath a fold of the skin just above the ring; the apex reached to the middle of the thigh, and possessed a small opening, through which the feces issued. Nothing had passed per anum since the period of the wound, except a little whitish matter, at intervals of three or four months. The surface of the swelling was everywhere red and folded; and these folds, resembling the valvular productions of the mucous membrane, were particularly conspicuous below. A smaller swelling, similar to the former in colour and consistence, and arising from the same opening, was placed externally to it. This had an oval form, and a puckered orifice discharging a little serous fluid. Both

possessed a kind of peristaltic motion, which could be excited by throwing a few drops of water on them.

“ This unfortunate young man was of a large and strong frame, but extremely thin, and forced, by the constant dragging which he experienced in the abdomen, to keep his trunk curved, in which position he could walk supported by two crutches. An earthen pot, suspended between the thighs, received the intestinal discharge, which acquired very soon an insupportable fetor.

“ It was soon ascertained, that the largest tumour consisted of the end of the intestine next to the stomach, in an inverted state; that the smaller was produced in like manner from the lower extremity of the bowel; and that the edges of the wounded tube were adherent to the opening in the abdominal parietes, forming with them a common cicatrix.

“ The depending situation, the exposure to the air, and the irritation produced by the rubbing of the patient's dress, and the constant contact of the discharged matters, had considerably thickened and indurated the parts. Yet DESAULT found that pressure by both the hands, continued for a few minutes, considerably diminished the swelling. He covered the whole, excepting the opening at its apex, with a simple bandage, carried round circularly from below upwards; and this had become so loose on the evening of the same day, that a renewed application was necessary. A similar renewal was practised, as the part diminished; and on the fourth day the intestine seemed reduced to its natural size. DESAULT now accomplished the entire reduction by introducing his finger into the opening, and pushing it upwards, so as to destroy the inversion. The smaller tumour presented no difficulty.

“ The patient's condition was already much improved by the return of the swellings. A thick tent of linen, three inches in length, was introduced into the intestine, and maintained there by a proper bandage. DESAULT proposed to remove this twice a day for the evacuation of the feces: but, after some noise in the bowels, accompanied with an acute sense of heat, wind passed by the anus. Colicky sensations and twitching pains in the rectum followed; and half a pint of fluid matter was discharged through the rectum. Eight evacuations of the same kind, preceded by similar feelings, took place during the night, and made the patient rather weak. The stools were very numerous the

three following days; but they gradually became thicker, and diminished in number. The linen tent was discontinued on the eighth day, and the opening was closed by lint and compresses, supported by a truss with a broad and flat pad. This plan entirely prevented the escape of fecal matter by the wound.

“ The young man quickly recovered. He regained his strength, and grew fat, although he ate only one third of the quantity, which he consumed before. During two months, which he spent in the hospital after this time, in order to ensure so extraordinary a cure, the fecal discharge was perfectly natural, and no inconvenience was felt. A very trivial serous exudation could hardly be said to stain a small bit of lint placed on the fistulous aperture.

“ This patient was travelling about for five months after he left the hospital, executing all his functions in the most healthy manner, and performing even violent exercises. In endeavouring for a wager to lift a cask on his shoulders, his bandage broke; but, as he felt no pain, he did not attend particularly to the circumstance, and proceeded to accomplish the feat he had undertaken. He continued walking for two hours, after applying his pocket handkerchief as a bandage. The intestine was again protruded, to the length of six inches, through the opening in the abdomen, which still existed. The same treatment as on the former occasion was again adopted with complete success.”*

The case quoted from SCARPA, in the following section, affords another example of successful treatment, conducted nearly on the same principles as those laid down by DESAULT.

The practice of DESAULT, having for its object to push back the projecting ridge, to open the angle of re-union, and thereby to render the passage from the upper to the lower end of the bowel more easy, is rational and judicious. But it is in most cases inadequate, or it gives relief without producing a radical cure. DESAULT himself allows that his method fails, if the internal angle be too acute; if the two portions of intestine, lying parallel to each other, have become adherent, and also if they are strongly connected by their extremities to the surrounding parts. He confines the employment of his me-

* *Œuvres Chirurg.* tom. ii. p. 370 et seq. The case is also related in the *Parisian Journal*, vol. i. p. 178; and another successful instance occurs at p. 370 of the same volume.

thod to wounds of the intestine without loss of substance, and where there exists a simple fistulous opening; at the same time he allows, that there are no certain means of distinguishing this from other lesions that the intestine may present, and in the treatment of which his method would fail.

Various attempts have, therefore, been made subsequently, to discover some more effectual method of removing the projecting ridge, and of re-establishing a direct communication between the two ends of the bowel. In 1798, SCHMALKALDEN, a German, conceived and executed the project of uniting directly the two ends of the bowel by perforating the septum between them. His plan is described in a dissertation, entitled, *Nova Methodus Intestina uniendi*; Viteb. 1798. This dissertation is mentioned in a note to the Memoir* of DUPUYTREN, who mentions no further particulars on the subject. In the same note, BARON DUPUYTREN quotes from DORSEY'S *Elements of Surgery*, 2 vols. 8vo. Philadelphia, 1813, the following passage, from which it appears that a similar method had been practised by Dr. PHYSICK. "In a patient with artificial anus, at the Pennsylvania hospital, Dr. PHYSICK performed an operation which will probably be found to afford complete relief in many similar cases. The sides of the intestine, in this instance, were consolidated laterally, or, in Mr. COOPER'S language, like a double-barrelled gun. In order to ensure this union, a ligature was passed through the intestine and suffered to remain a week, keeping its sides in close contact, after which Dr. PHYSICK cut a hole in the side of the intestine, where the two portions had thus united, and by stopping the external orifice, the feces regained their natural route, the external aperture was afterwards healed, and the patient relieved from his most loathsome complaint; he has for several years enjoyed perfect health." Vol. ii. p. 67.

Such was the state of our knowledge on the subject, when the investigation was undertaken by BARON DUPUYTREN, who had been struck with the inefficacy of the means hitherto employed, and thus led to inquire whether more effectual measures could not be devised for the relief of those labouring under this dangerous and distressing infirmity. He was then ignorant of the proposals made

* *Mém. de l'Académie Royale de Médecine*, tom. i. p. 290.

by SCHMALKALDEN and Dr. PHYSICK, and does not seem to have become acquainted with what they had done until after he had completed his own method.*

In the first place, DUPUYTREN distinguishes the cases of artificial anus requiring an operation, from those in which the powers of nature, aided by judicious management, may accomplish restoration.

“ The artificial openings, which affect only one spot in the circumference and length of the intestinal tube, are curable, whether complicated with a hernia or not. Properly speaking, these are stercoral fistulæ, behind which the intestine is nearly entire, having undergone no loss of substance, no contraction, nor any considerable change of direction. Such openings are naturally disposed to close; and nothing is wanted but slight pressure.

“ A considerable portion of the abnormal openings caused by the loss of one-third or one-half of the circumference, to an extent of not more than an inch in length, may also be cured, whether they are complicated with prolapsus or not. The loss of substance, and the change in direction of the intestine, the projection of the ridge and of the septum which forms it, are not so considerable as to constitute an insurmountable obstacle to the re-establishment of the natural passage. We generally succeed, in

* The proceeding of BARON DUPUYTREN was first made known to the public, in a detailed and authentic manner, by Dr. REISINGER, an intelligent and well-informed German physician, who spent a considerable time in Paris and London, and with whom I had the pleasure of being acquainted during his residence in this country. His work is entitled, *Anzeige einer von dem Herrn Professor DUPUYTREN zu Paris erfundenen, und mit dem glücklichsten Erfolge ausgeführten operations-weise zur Heilung des anus artificialis; nebst Bemerkungen von F. REISINGER, Augsburg, 1817*, with an engraving of the instrument employed by the Baron. An analysis of the work, with a figure of the instrument, may be seen in LANGENBECK, *neue Chirurg. Bibliothek*. band i. sect. iv.

A farther account was published in an English periodical by Dr. BRESCHET, who, as the intimate friend of the Baron, had not only aided him in his researches, but witnessed all his operations. *Considerations et observations anatomiques et chirurgicales sur la formation, la disposition, et le traitement des fistules stercorales et des anus contre-nature; par G. BRESCHET, M.D., &c. &c. premiere partie; Quarterly Journal of Foreign Medicine and Surgery; No. ix. seconde partie, ibid. No. x.* These papers, containing a full historical account of the subject, with details of numerous cases from the practice of DUPUYTREN, are found in a German version in the second volume of the *Journal der Chirurgie und Augen-Heilkunde* of GRAEFE and WALTHER; with four figures of the instrument employed by DUPUYTREN. At a later period DUPUYTREN made known his own views in a *Mémoire sur une Méthode nouvelle pour traiter les anus accidentels*; in the *Mémoires de l'Académie royale de Médecine*; tom. i., 1828; and in the article, *anus anormal*, in the *Dictionnaire de Médecine et de Chirurgie pratiques*; tom. i.; 1829.

such cases, by replacing the prolapsus, if there should be any, by employing exact compression to prevent the escape of the intestinal contents externally; by allowing a copious diet in order to dilate the contracted parts; and by making the patient move the trunk backwards and maintain it in that position, with the view of withdrawing the ends of the bowel towards the abdomen, and thus lessening the prominence of the ridge.

“ When the loss of substance extends to two-thirds or three-fourths of the circumference, with a proportional extent in length, it is the less likely to be cured, in proportion as the loss and the change of direction in the intestine are more considerable. The calibre of the bowel is so much diminished, and the ridge projects so considerably, as to impede very seriously the passage from the upper into the lower extremity. Yet the means already mentioned, combined with stronger compression, the use of purgatives, and that of tents, to dilate the intestine and lessen the angle between its two ends, succeed occasionally, as in some instances treated by DESAULT; but this treatment sometimes occasions unpleasant symptoms.

“ Restoration, however, is seldom accomplished by the united efforts of nature and art, when the loss extends to four-fifths or to the entire circumference of the intestine, with or without the mesentery, whatever may be the extent of the mischief in length. The destruction of the bowel, the contraction and change of direction in the tube, the projection of the ridge and septum, are here carried to the greatest extent, and constitute an insuperable obstacle to the transmission of the intestinal contents in their natural course. If compression be employed with sufficient exactness to prevent escape of the feces, symptoms of strangulation are produced, such as colic, nausea, vomiting, hiccup.

“ From numerous cases, partly observed by myself, and partly collected in the writings of authors, I find that the cases susceptible of cure, are to those which resist our efforts as three to one.” *

In all cases of artificial anus the indication of cure is twofold; namely, to destroy the projecting ridge, promontory, or spur, placed at the angle of junction between the upper and lower end of the bowel, and thus to remove

* *Mémoire*, p. 276—279.

the mechanical obstacle, which prevents the free passage of the intestinal contents from the former into the latter ; and then to close the external opening.

DUPUYTREN first attempted to accomplish the former indication by direct pressure against the ridge from without, with the view of pushing it back towards the abdomen. He constructed an instrument, of which one end was a crescent, three quarters of an inch in width, the edge and points being smooth and covered with linen. This crescent was fixed on a stem two or three inches long, terminated by an elongated plate, perforated with openings at each end for the passage of strings, by means of which the instrument could be fixed in its place. This plan was tried on a patient in the Hôtel Dieu with artificial anus. The concavity of the crescent was placed on the ridge, so as to press it from before backwards, when the strings were fastened round the pelvis. Pain, colic, and nausea soon came on, and the patient left the hospital unrelieved. This trial was made in 1809.*

The next attempt which DUPUYTREN made, was to establish a direct communication between the upper and lower ends of the bowel, by perforating the septum. As the coats of the two portions, which form this partition are simply contiguous without adhering, the perforation involves two wounds of the peritoneal cavity. It was, therefore, necessary to ascertain previously, that if a seton were passed through this part, the opposed serous surfaces would become united by that adhesive process which is so easily excited in such structures. This point was satisfactorily ascertained by experiments on animals. The proceeding was then tried in the human subject.

CASE.—A patient, named AUCLER, 36 years of age, came into the Hôtel Dieu in 1813, with a strangulated inguinal hernia. The swelling contained an intestinal convolution five inches long, in which the pressure of the stricture had caused a circular mortification. The bowel was left in the wound, and nearly the whole of it separated. An artificial anus was established, through which all the intestinal contents were discharged. The two ends of the bowel were perfectly parallel, and were separated by a very prominent septum and ridge. DUPUYTREN passed a needle from the upper into the lower part of the bowel, carrying it as high up as he could, and left the thread in

* *Mémoire*, p. 281.

the perforation thus made. Some days after, a seton was introduced into the opening, by means of the thread. From this time wind began to pass by the anus. The size of the seton was increased at each dressing: at the end of eight days, sensations of colic were experienced, and feces were discharged by the natural passage. The patient and the surgeon were greatly encouraged by this success; and the size of the seton was again increased, until at last the ridge was torn through. This produced no unpleasant symptom; on the contrary, the sudden enlargement of the opening rendered the communication more easy; but discharge still continued through the artificial anus. Being very desirous to put a stop to this, further attempts were made. DUPUYTREN concluded that the sides of the two portions of intestine had become adherent beyond the perforation, as well as on the side of it next to the wound. He, therefore, determined to cut away this portion of the septum by means of curved blunt-ended scissors, guided by the forefinger, taking care to cut a very small portion each time, and repeating the process every three or four days, until at last all the feces passed by the anus. The case was going on favourably, and would probably have ended in a complete cure, under continued methodical compression, when DUPUYTREN, yielding to the importunities of the patient, who wished to expedite the recovery, cut a little too far. Violent peritonitis ensued, and was rapidly fatal. On examining the body, no wound of the peritoneum could be discovered, but the usual effects of acute peritonitis were present. A communication had been established between the ends of the intestine to the extent of two inches. These parts, formerly separate, now constituted one cavity, on the front and back of which there was a longitudinal raphe, the cicatrix of the section which had been made in the septum. There was every reason to conclude, that this artificial anus would have been completely cured if the unfortunate occurrence just described had not happened.*

DUPUYTREN abandoned this method, because the perforation of the intestines, when not adherent, even although they should be contiguous, must be attended with danger of peritonitis, because it is difficult to carry and apply needles and threads high enough in the tube, to make the

* *Mémoire*, p. 286—289.

perforation at such a distance from the external opening, as to allow of establishing a sufficiently ample communication between the two portions of bowel; and lastly, because when the ends of the intestine, instead of being parallel and in contact, are separated from each other, there would be perforation without adhesion, so as to form a communication between the intestine and the cavity of the abdomen. It was therefore necessary to devise some method of proceeding, in which the parts would be brought into contact and rendered adherent before they were divided. An instrument was required to seize and hold the parts; to divide them slowly, exciting in the neighbourhood adhesive inflammation, so as previously to unite the surfaces which were to be divided.

DUPUYTREN constructed for this purpose an instrument, to which, from its effect in cutting through the septum and projecting ridge, he gave the name of *entérotôme*.* It is a forceps, made of two branches, which can be separated or united at pleasure, like those used in midwifery. The handles are approximated or separated by means of a screw passing through them, which fixes and retains them in any required position. The branches are each of them six or seven inches in length, consisting of a part called the blade, and another termed the handle, between which is the portion constituting the joint when the branches are brought together. The blade of one, which is called the male branch, is received to the depth of a line in a groove formed in the opposite or female branch, as the edge of a pocket-knife fits into the groove of its handle. This blade is four inches long, three lines wide, and half a line thick on what may be called its cutting edge, which is undulated, and terminates in a small spheroidal button. The female branch is grooved to receive the cutting edge of the male, the margins of the groove being undulated in correspondence with the waving line of the male branch, so that the projections and depressions of the two blades mutually cor-

* It is figured in the work of Dr. REISINGER already quoted; in GRAEFE and WALTHER's *Journal*, vol. ii. 1821. Tab. iii. fig. 1, 2, 3, and 8; these figures, which represent the details of the instrument, having been communicated by Dr. BRESCHET; and in FRORIEP's *Chirurgische Kupfertafeln*. heft 12, tab. 57, which exhibits, in the figures, the entire instrument of its natural size, with all the details of its construction, and plans showing its application and effect. Mr. KEY has also given a view of it as applied to the intestine, in the second edition of Sir A. COOPER's work on hernia, part i. p. 56.

respond. The button at the end of the male is received into a cavity of the female branch.

The mode in which this instrument acts, is obvious. The blades are introduced separately, one into each end of the bowel; they are united like those of the forceps used in midwifery, and then approximated, so as to include between them the projecting ridge, and more or less of the continuation of the bowel, at the part where the two portions lie parallel and contiguous to each other. The undulated edges of the blades, and the reception of the cutting edge belonging to the male into the groove of the female branch, give a firm hold on the included parts, and effectually preclude all risk of the instrument slipping. The first effect of the pressure is to bring the included portion of the two ends of the bowel into contact, and retain them in apposition: it may be increased so as to deprive them of vitality, but not to divide them immediately, the cutting edges, as they are called, being too thick to produce that effect.

“The first step,” says DUPUYTREN, “in employing this method, is to find the two openings of the intestine, and to determine accurately the direction taken by the corresponding portions of the canal. Usually this is the longest and most difficult part of the proceeding. The discharge of the contents generally points out to us, without much trouble, the orifice and course of the upper end. But greater difficulty is experienced in discovering the lower; and we do not succeed until after several days of attentive examination and observation.

“When the position of the openings and the course of the two portions of bowel have been ascertained, one branch of the *entérotôme* is introduced into one end of the bowel, carried according to circumstances to the depth of one, two, three, or even four inches, and then held by an assistant; the other branch is placed to a corresponding depth in the other end. The two are now brought together, united, and firmly fixed. Nothing more is necessary, in order to have a secure hold on the parts, than to bring together the handles. As the effects of the *entérotôme* must be slow and gradual, lasting for seven or eight days, we could not trust to anything but mechanical power for maintaining the action and increasing it when necessary. This is accomplished by the screw, which enables us to bring to-

gether the blades so as to extinguish vitality in the parts embraced.

“ We need not fear to carry the pressure of the entéro-tôme, on the first day, so far as to suspend life in the included parts. This is the plan most likely to prevent pain and inflammation. We should increase the pressure every two days, to prevent all risk of the circulation being re-established at some point, so as to render the division of the parts incomplete.

“ It might at first be expected, that the introduction of an instrument into the abdomen, and the application to two parts of the bowel of pressure sufficient to extinguish their vitality, would cause pain, colic, and vomiting, would suspend or impede the course of the intestinal contents, and thus excite serious disturbance in the constitution, and that the inflammation excited by the presence and action of the instrument, would extend rapidly from the affected parts to the peritoneum and intestinal canal. These apprehensions had been already lessened by experiments on animals; they were entirely removed by observing what happened in the human subject. Most of the patients, on whom this operation has been performed, have experienced merely slight pain when the entéro-tôme was applied. In a few instances only was colic, nausea, or vomiting brought on. The contents of the intestinal canal have followed their accustomed course; the inflammation has been confined to the parts embraced by the instrument, without spreading to others, either neighbouring or remote. There have been no rigors, fever, nor want of sleep; and, with a few rare exceptions, the tranquil state of the patients has presented a striking contrast with the serious symptoms which might have been expected to follow such an operation.

“ When first applied, the entéro-tôme is fixed; it becomes loose in a few days, the looseness increasing till it falls out of itself, without pain or loss of blood, the separation having occurred, in all our patients, from the seventh to the tenth day.

“ The blades of the instrument are found closely approximated, being separated only by a brown membranous band, dry and hard like parchment, three or four inches long, two or three lines wide, and a quarter of a line thick. If this is macerated for a few hours in warm water, its texture is in some measure restored, it becomes thicker and

flexible, so that we can soon distinguish the tunics of the two portions of bowel. This strip is indeed cut out of the intestines by the instrument; and its dimensions give us the exact measure of the loss of substance, which they have experienced.

“ By this division and loss of substance, the ridge and the double septum, which separate the two ends of the bowel, are destroyed, so as to re-establish the intercepted communication between them, and restore the natural course of the aliment or feces. Frequently, the first indications of this restoration in the lower portion of the canal are experienced before the *entérotôme* comes away. Slight colicky pains come on in all cases, and are followed by evacuations, consisting, at first, of the whitish albuminous matters contained in the lower bowels, and subsequently of feces transmitted from the upper part of the canal.

“ The evacuations are at first numerous, liquid, attended with colic and griping, which we must refer to irritation of the bowel by the passage of matters, to which it had been long unaccustomed. These symptoms go off gradually; the stools become consistent, being voided at longer intervals; natural appetite returns, and the patient recovers his flesh and strength.

“ All that now remains is to close the opening in the abdominal parietes, the last trace of the artificial anus: this, however, is the most difficult and longest part of the cure. The slow and gradual division of the double septum is accomplished in eight days; the natural course of the intestinal contents is re-established and rendered regular in still less time; while several weeks or even many months are required to effect the closure of the external opening. Sometimes, indeed, we have been unable to accomplish this, although the aperture had become useless, and could be kept closed for ten or fifteen days consecutively, without causing any uneasiness.”*

The following was the first case, in which DUPUYTREN employed his method, which it is well calculated to illustrate.

CASE.—“ MENAGE, twenty-six years old, had been the subject of right inguinal hernia from his earliest infancy. The complaint, left to itself, had become strangulated in

* *Ibid.* p. 299—303.

1815. The symptoms were of the most violent kind, and continued to the sixth day, in spite of copious bleedings and strong efforts at reduction. He was now operated on at the hospital of Chateaudun. The intestine was mortified; for, on the next day, feces passed through the wound. The intestine, hernial sac, and surrounding cellular tissue, were successively destroyed, and an artificial anus was established. Through this opening the whole intestinal contents were discharged, presenting themselves about an hour and a half after they had been swallowed, not in the order of their introduction into the stomach, nor in that of their digestibility, but according to the relative quantity of nutritive substance which they contained, those with the smallest proportion coming out first, and the least changed. Thus vegetables were voided in about an hour, and nearly as they had been swallowed, meat not till the end of two hours, and in a much more advanced state of digestion. The appetite was voracious; but the food, voided so soon after it had been eaten, could not afford due nourishment, and thus the patient rapidly lost flesh and strength. Seven or eight weeks after the operation, violent cholic came on, followed by evacuations at the natural opening: these were repeated at long intervals. *MENAGE* continued in this state for a year, at the end of which time he entered the Hôtel-Dieu.

“ The artificial anus was half an inch in diameter. Its entrance was bordered by irregular elevations from swelling of the intestinal mucous membrane. At the least effort it was elevated and pushed forwards by a hernia, which descended behind. Sometimes an intestinal prolapsus occurred at the opening. The surrounding skin was irritated, and deprived of its epidermis. The patient's sufferings were excessive; and an insupportable stench exhaled from his person. He was willing to undergo any pain or risk for the sake of a cure.

“ Some days were employed in removing the irritation of the skin; and I then endeavoured to find out the relative position of the two ends of the bowel. These attempts, renewed at intervals, were for a long time unsuccessful. The ends of the intestine were drawn down by the hernia, so that the finger or instruments introduced into the canal went first downwards and then upwards; and this change of direction caused great embarrassment. These difficulties were overcome after some time and many examinations. I

discovered the two ends of the bowel, the ridge and septum. I immediately introduced the *entérotôme*, carrying in the branches to their full extent, and, having united them, brought together the blades with moderate force, no pain being experienced. The pressure was increased the next day, and the patient felt slight colic. In a few days the instrument became rather loose, and small evacuations occurred by the anus; it was detached between the seventh and eighth day; the blades being separated only by a strip of membrane, in which all the tunics of the two contiguous intestinal parietes could be distinguished. This strip was thin and dry like parchment, twenty lines in length and two lines wide; those dimensions showing exactly how deeply the instrument had entered, and the loss of substance which the intestinal septum had experienced. The natural course of the feces was soon re-established, and their escape by the artificial opening could be prevented by external pressure, which was employed for that purpose in various ways.

“ Yet, although the artificial opening was no longer required for the passage of the feces, and it even contracted considerably, it did not cicatrise completely. I endeavoured to accomplish the closure by employing plugs of charpie dipped in colophony, by the use of the *spica* bandage and of a simple truss; by approximating the sides with strips of adhesive plaster, and cauterising them with the nitrate of silver. I even went further, in order to close this opening, now reduced to not more than a line in diameter: I excised the edges formed by the skin and mucous membrane, and brought the parts together by the twisted suture. Subsequently I employed an instrument, which I shall describe elsewhere. At the end of four months I had the satisfaction of presenting to the faculty of medicine this patient entirely cured of his artificial anus, and recovered from the serious effects which the infirmity had caused in his whole system.”*

A case of artificial anus consequent on a wound was successfully treated in the same manner.

CASE.—L. TRUBERT, a thrasher, married, and having five children, was received into the *Hôtel Dieu*, in March, 1824, on account of an artificial anus. He was of small stature, and good constitution, but of limited intellectual

* *Ibid.* p. 296—299.

faculties, a bilious and melancholy temperament, which had led him to shun society, and even to avoid that of his own connexions. He was excessively thin and weak ; his countenance sallow and dingy, with an expression of vacancy and sorrow : he spoke seldom and slowly, chiefly in monosyllables. An exertion, which he had made fifteen years before, had caused a hernia in the left groin. He had entirely neglected the swelling, which had become equal in size to the head of a fetus at full time, and was in great part irreducible. Annoyed by the bulk of the tumour, and fancying that it exposed him to the ridicule of his neighbours, he indulged more and more in solitude, and at last formed the project of removing the source of his sufferings. For this purpose he made a large incision in the scrotum with a rude knife, and opened the hernial sac, from which a convolution of intestine, eighteen inches long, came out. He recovered favourably from this wound, retaining, however, his hernia and his melancholy notions with the design they had engendered. He refused to wear a truss, and even suspected the motives of those who advised it. In February, 1834, three years after the first attempt, he repeated it, opening the rupture, seizing the intestine, and cutting off a portion. The physician who saw him enlarged the wound, found the ends of the bowel, and united them by sutures. The latter proceeding did not accomplish the desired purpose, and an artificial anus was the result.

The portion removed belonged to the small intestine ; it was two inches and a half long ; but the cylinder was not entire, being imperfect at two points.

When TRUBERT came to the Hôtel Dieu, there was a tumour, as large as a child's head at full time, extending from the left inguinal ring to the bottom of the scrotum : it was firm and partly reducible. At the anterior and lower part there was a surface of bright red colour, formed below by the scrotum, above by two portions of intestine everted and protruded, and placed side by side. From that on the right, semi-fluid feces escaped, mixed with undigested matters, such as pieces of carrot and other vegetables. This efflux was constant and involuntary. From the other nothing escaped. The patient complained of itching round the wound, of colic, and of permanent pain in the left inguinal region. He was excessively dirty, indulging in the habit which some deranged persons have of handling and rolling the feces.

When the ends of the bowel had been replaced, compression by bandage was resorted to, but it could not be borne. Clysters were administered, and food was given with caution. Yet the weakness and loss of flesh increased. I therefore began an examination in order to determine the relative position of the two ends of the bowel: that corresponding to the stomach went down to the bottom of the scrotum, while the rectal extremity ascended towards the inguinal canal. The unfavourable position of the upper end of the bowel, with the weakness of the patient, and his unsatisfactory state of mind made me abandon the intention of operating; and I thought it enough to feed him well and keep him clean. But he at last expressed a desire that the method which had been useful to others should be employed in his case. I did not pay much attention to his request, but as the idea gradually took possession of his mind, I thought it best to gratify him by making the attempt.

I introduced the branches as deeply as I could; but that which was placed in the upper end would not penetrate further than from two inches and a-half to three inches. The entérotoûme was therefore fixed in that situation. No material inconvenience was experienced; and the instrument came away on the eighth day. The portion of the septum brought away between the blades was less than three inches long, and some lines in breadth. The feces did not begin to pass by the anus till fifteen days after the operation; and they still continued to flow partly through the artificial opening. Much difficulty was experienced in closing this; but the efforts of the surgeon were at last successful, and this unfavourable case was completely cured in five months.*

The method of DUPUYTREN was employed successfully by professor LALLEMAND of Montpellier, who had the opportunity of examining the parts after death at the expiration of some years from the termination of the treatment, and of thus ascertaining the changes produced ultimately in consequence of the operation.

CASE.—JEAN CYPRIEN, a fisherman, near Montpellier, forty-six years of age, of small stature and robust constitution, had been afflicted for the last twenty years with scrotal hernia, for which, after neglecting it entirely, he

* *Ibid.* p. 304—311.

had of late years worn a badly-constructed truss. On May 2, 1821, finding the pressure of the bandage troublesome, he took it off while at work, when the rupture descended and became painful: he could not return it. He passed a bad night with vomiting, pain, and tension in the abdomen. These symptoms continuing, he was brought on the 4th to Montpellier, and received under the care of M. DELPECH. In the left groin there was a swelling as large as two fists, oblong, firm, irreducible, and extremely painful. The iliac region was swollen and painful; the abdomen rather enlarged, but indolent; the face and conjunctiva yellow, the tongue clean and moist; the pulse small, slow, and easily compressible: there was great thirst. In the operation, which was performed in the evening, the cellular tissue round the sac was found infiltrated. The tumour contained a convolution of intestine, eight inches long, distended with air, ecchymosed, brown, and covered with a thin adventitious membrane: its vessels were filled with blood. Much turbid serum escaped when the stricture was divided. The intestine was replaced with difficulty; and the wound was closed with nine points of suture. It was not opened till the fourth day, when the upper sutures were removed, and a considerable quantity of turbid bloody serum flowed from the wound. A considerable quantity of similar fluid was discharged on the following day. In the night of the sixth day, the patient was awakened by a feeling as if something had been torn in the left iliac region, and fecal matter came through the wound. It continued to pass in this way more or less abundantly; the wound, however, contracted, but the natural passage of the intestinal contents could not be restored.

“On the 1st of September,” says Professor LALLEMAND, “when I undertook the charge of the patient, the skin of the inguinal region was red, excoriated to a considerable extent, acutely sensitive, and puckered into numerous thick folds converging to the opening for the passage of the feces. The latter admitted with difficulty the end of the little finger. I introduced easily a female catheter, but it did not enter the intestine till it had traversed a space of an inch and a-half. The narrow passage, which formed the communication between the cavity of the intestine and the external opening, was the inguinal canal contracted after the operation. About one-third of the feces passed in their natural course; but as the patient had remained in the

same state for two months, no further advantage could be expected from the retraction of the mesentery, and it seemed to me necessary to proceed to the ingenious, simple, and safe method of destroying the projecting ridge, which I had seen employed with so much success by M. DUPUY-TREN. There was, however, a considerable difficulty from the distance between the external opening and the ridge, which amounted to two inches. It was necessary to enlarge this part by pieces of sponge, which were often forced out by the flow of matters from the intestine, and the object was not sufficiently accomplished till October 25, when the whole little finger could be introduced, the projecting ridge could be felt, the two openings of the bowel were recognised, and a female catheter was placed in each: fecal matter flowed out of one tube, and a viscid, tenacious, transparent fluid came through the other. I now introduced the branches of the *entérotôme* into the two ends of the bowel and united them: their extremities were two inches and a half apart. I turned the screw connecting the handles until the patient experienced a smart pain directed towards the navel, when I found that the instrument held firmly by the parts included between its blades. The pain ceased in half an hour. At mid-day the patient increased the pressure by giving the screw two or three turns; at eight in the evening I did the same. Each time the increase of the pressure occasioned colicky sensations of short duration. The patient passed a good night. The next day the forceps were tightened three times with the same result. The third day this was again done, and in the evening the screw had acted to its full extent, and the branches were in contact. Nothing had passed by the anus since their application, but feces flowed plentifully through the opening. A perfectly quiet night. On the fourth day there was a small stool; the instrument could be turned a little. When the patient awoke in the morning of the fifth day, he found it by his side, felt the feces passing towards the lower end of the bowel, and had a copious stool. The abdomen was soft and free from pain; but there was no appetite, and the patient was very irritable.

“ Between the blades of the *entérotôme* there was a slip of membrane blackish brown, quite dry, two inches long, three lines wide, of the thickness of a playing card. It was moulded on the undulated edge of the male branch,

and applied over its two surfaces. When detached, it preserved the form of an undulated channel, a line in depth. It was unintentionally thrown away, so that I could not examine it after maceration. With the finger introduced the next day, I could distinguish the edges of the divided septum, but I could not reach the end of the division. A compress of charpie was applied with the spica bandage. A little fecal matter came through the wound on the sixth day; but there was no stool. The patient became quite intractable, and would use none of the means directed for him. The bowels were not relieved till the evening of the tenth day, when he had an evacuation by the anus, that filled two basins, nothing having passed through the fistula. The thirteenth day, there were two equally copious stools. On the fourteenth, he was prevailed on to have a clyster; it was followed by two motions. He now had a clyster regularly night and morning for a week, at the end of which time nothing passed through the fistula. The orifice closed so rapidly, that in fifteen days it was not as large as a crow-quill, and could only be discovered by separating the folds of skin. The patient now regained his strength, and walked about the ward without any bandage. The edges of the opening were touched for three or four days with nitrate of silver; it was then covered by an elastic bandage, and in four or five days it had closed. The cicatrix was slightly torn from a fall in going down stairs twelve days after; some blood and mucus escaped. Rest and the bandage soon restored the parts; and the patient left the hospital on the 14th of December, having been quite well for three weeks. He took a dislike to meat as soon as the natural course of the intestinal contents was re-established, and returned to vegetables, which he had always refused as long as the artificial opening existed.

“ CYPRIEN survived the operation seven years, enjoying excellent health except on four occasions, when his health suffered from his own imprudence, so as to oblige him to come into the hospital. In the intervals he experienced no other inconvenience than a slight mucous exudation from an opening that would hardly admit a probe. He wore an ordinary truss: a piece of folded linen placed under the pad sufficed to absorb the moisture. On two occasions, after violent exertions in the water, a large swelling came in the region of the hernia; the skin gave way at several

points, giving issue to fetid pus in great quantity, mixed with gas and fecal matter. The openings closed subsequently, and the complaint returned to its former state. Another attack of inflammation in the same part, brought on by great exertions in rowing for several days, ended in resolution. At last he died from an attack of gastro-enteritis, probably caused by the coarse diet, the intemperance, and fatigues incidental to his occupation as a fisherman.

“On examining the body after death, there was found in the left inguinal region an oblique fistulous opening leading into the canal of the size of a crow-quill. Round this, to an extent of five or six lines, was a thin shining cicatrix, in which wrinkled folds of the surrounding integuments terminated. A portion of ileum, not differing from the usual appearance of the intestine, was adherent to the left inguinal region by two slender columns. One of these, four lines long by two in width, contained the canal of communication between the fistula and the cavity of the intestine. This canal passed through the inguinal ring, which was short and nearly direct. The other was an ordinary slender fibrous adhesion.

“There were several ulcerations of the mucous membrane towards the ileo-cæcal valve.

“As soon as the fistulous communication had passed the ring, it began to enlarge and assume the funnel shape, and was quickly lost in the cavity of the intestine. When the latter, which presented the usual circular figure, was laid open, a slight prominence marked the situation which had been occupied by the ridge: the mucous membrane was just the same here as elsewhere.”* In short, the intestine, which had not only been retracted within the abdomen, but carried to some distance, so as to be quite free from the inguinal canal, excepting at the adhesion already mentioned, and had recovered its natural curve within the belly, presented very little appearance, either on the exterior or interior, of the loss of substance which it had undergone, and of the operation, by which the natural course of its contents had been restored.

Professor DELPECH, of Montpellier, employed with suc-

* *Observation sur un cas de guérison d'anüs contre nature ; in the Répertoire général d'anatomie et de physiologie pathologiques, &c. ; tom. vii. p. 133 ; with three figures representing the artificial anus, the intestine in its situation, and the same laid open.*

cess, in a case of artificial anus, an instrument somewhat differently constructed from that of DUPUYTREN. It consisted, like the latter, of two separate branches, which could be introduced distinctly into the two ends of the bowel, and then be united. Each branch ended in an oval plate an inch in length. When they were introduced, and brought together by a screw acting on the opposite ends, these plates were brought into contact, so as to press on the included portion of the intestinal septum, while, in consequence of the branches being a little curved, they did not come into contact or press in the rest of their extent. The object was to destroy a smaller portion of the septum at one time, and to repeat the process until a sufficient opening should be made in it.

The female, in whose case this instrument was used, being then at the end of the third month of pregnancy, underwent the operation for strangulated femoral hernia on the 5th of May, 1829. The strangulation had lasted twelve days, and the intestine was found opened by mortification, the result of which was the establishment of an artificial anus. The instrument was applied on June 15. The included part had given way on the 26th. It was again fastened, so as to include the portion immediately adjoining the former in the direction of the artificial anus on the same day. The application was repeated in the same manner on July 8, and the instrument was laid aside on the 15th, when the artificial opening was subjected to compression by the pad of a non-elastic truss. The efflux from the latter gradually lessened, and the discharges by the natural passage became more regular. The pregnancy went on favourably, and the motions of the fetus indicated that the child was well and lively. The edges of the external wound were touched with the nitrate of silver on the 15th of August, and the following day. The progress of utero gestation and the consequent distention of the integuments, were unfavourable to the closure of the wound. On the 1st of September, the edges had cicatrised separately; nothing escaped so long as the compression was maintained. Caustic potash was applied to the integuments round the crural opening in the extent of eight lines; when the slough had separated, simple dressing and compression were employed: the contraction of the cicatrix reduced the preternatural opening to a few lines, and nothing escaped but a few drops of serous fluid. The patient was delivered na-

turally and easily of a healthy child at the full term, on the 8th of November. The artificial opening now became closed by a firm cicatrix, the functions of the bowels were re-established; the appetite, health, and strength were completely restored. The cicatrix was supported by an elastic truss, with an ivory pad, covered by cotton wadding.*

DUPUYTREN presents, in the following statement, the results of his own experience and that of others in the use of the entérotoûme. "Forty-one operations have been performed, twenty-one by myself, and twenty by other practitioners. The bowel had mortified from strangulation in three-fourths of the cases; in the other fourth three had been wounds with loss of substance. Three cases terminated fatally; one from supposed fecal effusion into the abdomen; another from indigestion; the third from peritonitis excited by the operation. The disease in these was inflammatory, and resisted the most energetic and appropriate treatment.

"Of the remaining thirty-eight, the greater number had no unpleasant symptoms; some indeed had colic, nausea, and vomiting; but these symptoms yielded to drinks containing carbonic acid, to leeches round the anus, and fomentations of the abdomen.

"The cure was not equally complete in all. *Fistulæ*, more or less extensive, remained in nine, rendering the constant use of a truss necessary in order to prevent the involuntary escape of air, mucus, bile, and even fecal matters. Twenty-nine patients were completely and radically cured in periods varying from two to six months.

"Thus, in estimating the danger of the proceeding, we see that it has been fatal only in one case out of fourteen; and, if we put aside the patient who died of indigestion, the mortality is reduced to one in twenty; a result, which may surprise us, when we compare it with that of other great surgical operations: it can be explained only by the slow and gradual action of the instrument.

"One-fourth of the patients were relieved only of the involuntary escape of feces through the artificial opening,

* The history of this case is contained in the *Mémorial des hôpitaux du Midi*; Fevrier, 1830; from which a German translation has been published in the *Notizen* of FRORIEP; vol. xxvii. p. 169, with a figure of the instrument. The latter is also represented in the *Chirurgische Kupfertafeln*; taf. 268, fig. 4.

and were obliged to wear a bandage constantly, a state incomparably better than their previous condition. The other three-fourths were cured radically, without being subject to the symptoms and lacerations of the cicatrix, which occur occasionally to those who have received a spontaneous cure. The reason of the difference is obvious; nature re-establishes the communication between the upper and lower ends of the bowel slowly and insufficiently; art restores it at once, and gives it ample dimensions.”*

It appears from observations of M. JOBERT, that the representations of DUPUYTREN respecting the mild nature and successful results of his method are to be received with some allowance. He objects to the plan of closing the blades of the entérotôme on their first application so powerfully as to destroy the life of the included parts, observing that he has seen all the symptoms of strangulation brought on by such pressure, and continuing until it was lessened by relaxing the screw.†

Instead of finding that the use of the instrument produced no symptoms of any consequence, but merely local inflammation without rigors, fever, or want of rest, he states that the patients observed by himself were affected with fever, heat of skin, and vomiting; and that the face became drawn, contracted, and of dark hue. He adds that a patient died in the Hôtel Dieu of Amiens of entero-peritonitis, occasioned by the application of the entérotôme, and that other fatal instances have been recorded.‡

The application of the entérotôme was unsuccessful in the following case treated by M. VELPEAU.§

CASE.—A patient, fifty-six years old, had a left crural hernia since the age of eighteen: it was as large as a walnut, passed in and out with facility, and had never been retained by a truss. It became strangulated on the 17th of April, and was operated upon on the 27th, when the intestine was found mortified; the feces subsequently passed through the wound. The entérotôme was applied on May 14, came away on the 21st, and the patient died the same day. It was found that the edges of the opening made in the intestine were united on one side only; that they were

* *Mém. de l'académie royale de médecine*; tom. i. p. 313—315.

† *Traité des mal. chirurg. du canal intestinal*; tom. ii. p. 125.

‡ *Ibid.* p. 126.

§ *Journal hebdomadaire*; Juillet; 1836.

quite unadherent on the other, so that there was a free communication between the intestine and the cavity of the peritoneum, which had become inflamed, and was filled with sero-purulent effusion.

The event of this case might have been different if a longer time had been allowed to intervene between the operation for the strangulated rupture and the application of the *entérotôme*. The latter proceeding should never be attempted until a sufficient period has elapsed for the local changes in the intestine and surrounding parts consequent on mortification to be completed and consolidated, and for recovery of the general health. In the present instance this obvious maxim of prudence was altogether disregarded.

When we consider the organisation of the intestine, its susceptibility of inflammation, together with the local and constitutional effects usually caused by such disturbance, we must expect serious symptoms to result from a treatment, in which two portions of intestine are subjected, in an extent of two, three, or four inches, to a pressure sufficient to destroy life : and such a method cannot be regarded as otherwise than dangerous. This danger may perhaps depend in some degree on the mode of application rather than on the principle of the plan ; and thus, perhaps, it may be found safer to apply moderate pressure in the first instance, and to increase it gradually. Future experience may also show that the milder and slower proceeding of *DELPECH* is less dangerous than the method of *DUPUYTREN*. The danger, however, even if we take it at its highest amount, is not sufficient to deter us from adopting an efficacious remedy for an infirmity, which sometimes would bring life to an end by gradual exhaustion, while it is attended in all cases with annoyances so distressing and insupportable, as to destroy all comfort and even render existence burdensome.

The method of *DUPUYTREN*, which I have now fully described from his own printed statements, founded as it was on a long series of anatomical, physiological, and practical researches, aided by persevering reflection and a remarkable fertility in resources against surgical obstacles and difficulties, does the highest credit to the talents, knowledge, and ingenuity of its illustrious author. It is not adapted to all cases of artificial anus ; but to those only, in which the two ends of the bowel either lying pa-

parallel to each other, or being united at a somewhat acute angle, are separated internally by a projecting ridge, which prevents their free communication. The first object therefore will be examine the case carefully, in order to ascertain that point. The introduction of the finger for that purpose, and indeed the application of the instrument itself, may perhaps require some enlargement of the external wound. The ordinary female catheter may be passed into the bowel to ascertain its direction; and if we employ one for each end, we shall readily discover the relative course and position of the two portions of intestine.

As the interval between these in the abdomen may be occupied by any portion of the loose viscera, we must inquire carefully into that point, and satisfy ourselves that the two intestinal parietes are in immediate contact before we proceed to fix the entérotôme.

This plan of treatment is not applicable to the cases of artificial anus, in which the intestine preserves its natural curve, and there is no projecting ridge.

The blades have been made to embrace a depth of from one to four inches. We must be regulated in this point by what we may discover on careful examination of the parts: it is desirable to establish a free communication between the two portions of bowel, and therefore to introduce the instrument to its full extent, if the circumstances should be favourable. If the two portions of bowel are not parallel, or if they are separated by a more or less considerable interval, it is desirable that their union should be firmly consolidated, so that the abdominal cavity may be closed before the separation of the slough. This point will probably be best accomplished by proceeding slowly: if the entérotôme were so applied as to cut through quickly, fatal exposure of the cavity might be feared, as in the case already quoted from M. VELPEAU; see *ante*, p. 412.

When we consider the structure, functions, and morbid affections of the parts concerned, and the severe mechanical irritation to which they are subjected in this mode of treatment, we shall not be surprised that pain and tension of the abdomen, colicky sensations, vomiting, thirst, restlessness, and other indications of intestinal and peritoneal inflammation, follow the application of the instrument.

It will be expedient to prepare the patient by rest in bed for a few days, and by attention to diet, as well as to the state

of the alimentary canal; after the forceps have been applied, he should be kept perfectly quiet, restricted to light and simple food, and should employ occasionally mild purgatives by the mouth, and clysters. If the pain and other symptoms cannot be removed by the use of warm cloths or fomentations, the pressure of the forceps must be lessened by means of the screw, and again increased when the patient can bear it.

The successful removal of the part embraced by the forceps, and the consequent establishment of a free communication between the upper and lower ends of the bowel, restore the proper course of the alimentary matter; the stools are voided naturally, and no longer go through the artificial opening, which contracts, but does not entirely close. A small aperture remains, giving passage to a thin yellowish fluid, and sometimes allowing the escape of fecal matter; in short, he has a fecal fistula instead of an artificial anus; and he is a sufficient gainer in the exchange. The difficulty of closing the fistulous aperture is great; the ingenuity and patience of DUPUYTREN were severely tried in various contrivances and proceedings for accomplishing this purpose, and he does not seem to have succeeded in all instances.

Cases of artificial anus must be much more numerous in Paris than in London. DUPUYTREN employed his method in between twenty and thirty instances within a short time. No opportunity has occurred to me of putting it into practice, either at ST. BARTHOLOMEW'S Hospital, or elsewhere, for several years; and I believe that it has hardly been employed at all in this country.

SECTION VI.—PROLAPSUS OF THE INTESTINE THROUGH THE ARTIFICIAL OPENING.

It happens not unfrequently that the intestine protrudes at the artificial anus; there being no sphincter muscle to prevent this occurrence. The tumour thus formed is generally more or less conical, contracted at the basis, and perforated near the apex by an opening, which transmits the alimentary matter, if the protuberance issues from the

upper end, and a whitish fluid or clysters, if it comes from the lower extremity of the intestine. The gut is necessarily inverted, so that its mucous membrane constitutes the exterior surface of the tumour; which is consequently moistened by mucous secretion. The colour of the swelling is red. Usually it is not very sensible. It is small at first, becomes gradually larger, and has been seen to exceed a foot in length.* Its size varies, being larger in the erect position, and after exertion, smaller when the subject has been quiet in bed: in the latter state indeed it often disappears.

Since the bowel is protruded in these cases through an opening formed by the cicatrix of the wound, and consequently possessing considerable firmness, it may experience pressure when a larger part is forced down. The tumour increases in size, and becomes livid under such circumstances; and the passage of the feces may be interrupted. A slighter degree of pressure continued for a long time may produce thickening of the part; and we can easily conceive, that adhesions, rendering the parts irreducible, may arise from the same cause.

The prolapsus may take place either from the upper or lower end of the intestine, or from both. In the first of these cases the feces pass from the middle and most prominent part of the swelling; in the second from the side of its basis; while in the third there are two swellings; from the centre of one of which the evacuations proceed.

The complaint may come on gradually, and as it were spontaneously; or it may be produced suddenly by any effort, such as violent coughing, or straining at stool. It does not in general cause serious inconvenience, as it can be replaced at pleasure.

CASE I.——— JEFFERIS, sixty years of age, has voided all his stools through the groin for about seventeen years, and still retains the external appearances of health and activity.

His complaint was a scrotal hernia of the size of a pigeon's egg, before the occurrence of the strangulation, which terminated in mortification. The testis on the same side, and a large portion of the surrounding integuments,

* A protrusion of the colon, measuring sixteen inches in length, is described by SCHACHER in his *Diss. de morbis a situ intestinorum preternaturali*, in HALLERI *Disp. Chir.* tom. iii. N. 78.

were involved in destruction with the hernia. The progress of the case, during the mortification and recovery, presented nothing that requires to be particularly noticed.

He has never worn a truss, nor taken any measures to obviate the inconveniences arising from the discharge of the feces, except that of keeping always a quantity of tow in his breeches.

A prolapsus of the intestine has taken place through the artificial opening. The projecting part varies in length and size at different times. It was four inches long when I saw it; and the basis, which is the largest part, measured nearly six inches in circumference. This prolapsus never recedes entirely, but is sometimes considerably smaller. It has occasionally protruded to the length of eight or ten inches, being at the same time equal in size to the fore-arm, and bleeding copiously. This is attended with great pain, and only happens when the bowels are much disordered. Warm fomentations, and a recumbent position, relieve in this case, by causing the gut to return.

The prolapsus is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucous secretion. It feels firm and fleshy, and can be squeezed and handled without exciting pain: it approaches on the whole to a cylindrical form, and its anterior loose extremity which is of circular figure, contains a roundish depressed opening, through which the stools are voided. The basis of the swelling is continuous on all sides with the integuments, and I could discover no opening of the lower end of the gut.

This person does not possess the slightest power of holding the stools. They are often voided suddenly, and, to use his own expression, without giving him any notice. When the feces are fluid, which is generally the case, they come away repeatedly in the day, and are discharged with considerable force: but, when they are of a more firm consistence, there is not more than one stool in one or two days, and their expulsion requires much straining. At these times their size is not greater than that of the little finger.

Whenever the urine is retained, after an inclination to void it has been felt, a quantity of clear inoffensive mucus, like the white of an egg, amounting to about four ounces, is expelled from the anus, and this may occur two or three times in the day.

He does not confine himself to any particular diet. When he is purged, the food frequently passes with little alteration; this he has noticed particularly of cucumber. He experiences great weakness at such times. Ale will sometimes pass off in five minutes from the time of drinking, having apparently undergone little or no alteration.

The bowels are strongly affected by slight doses of purgatives. A quantity of rhubarb, sufficient to cover the finger nail, will purge for three or four days.

CASE II.—“The first opportunity which I had, of observing this affection, occurred,” says SABATIER,* “some years ago in a young man who had an artificial anus about the middle of the right hypochondrium. There was a round opening about an inch in diameter, and a somewhat soft and red tumour, equal in size to the fist. The latter had its origin within the aperture, was surmounted irregularly with small tubercles, rather larger than hempseeds, and covered with a mucous fluid. The feces are discharged at its basis, in a liquid and inodorous state. The complaint had subsisted from the age of nine months; nothing coming per anum, except a very little hardened matter of a white colour. The tumour was of a more recent date, and was increasing in size. It gave him no pain, although exposed to the air, and frequently washed with cold water. Liquids appeared through the wound unaltered, very soon after they had been swallowed. Pressure occasioned considerable pain. This young man, being prevented by his infirmity from engaging in laborious employments, derived his subsistence from begging in the high road to Antoni, near Verrieres. He is now in Paris, where I have frequently seen him, and find no alteration in his complaint, except that the tumour is elongated.”

CASE III.†—“In a soldier, who was operated on for an inguinal hernia of the right side, the excrements passed partly through the wound and partly through the anus. The former, for what motives we cannot conjecture, was kept open by means of a tent introduced at each dressing: and at last the whole of the excrement, excepting a very small quantity at distant periods, came by this way. About a year afterwards, he experienced, in the hospital at Toulon, a sudden and severe attack of colic, in consequence of

* *Mém. sur les anus contre nature; Mém. de l'Acad. de Chir.* tom. v. p. 592. The case is at p. 599.

† *Ibid.* p. 600.

eating some boiled chestnuts. Being obliged to go to bed, he found at the wound a red tumour, equal in size to a small nipple: this increased very rapidly to the bulk of the fist. The pains in the abdomen were considerable, and the part grew livid. He was relieved from this attack, a few thin eschars separating from the swelling, at the basis of which the feces continued to be discharged. The prolapsus varies much in size; is ordinarily about six inches long, and one and a half in diameter, and exhibits, very clearly, the folds and glands of the intestine. It is not painful. The feces flow constantly from its basis in a fluid state, without the patient being conscious of their discharge. Small hard lumps, resembling fat in appearance, are occasionally expelled from the rectum. The patient is in a good state of health, and tolerably lusty and strong.

In the following two cases there was a double protrusion; and a similar instance is related by FABRICIUS HILDANUS.*

CASE IV.†—"A soldier, twenty years of age, received a sword wound at the battle of Ramilies, under the ribs of the left side. This was extensively dilated; and the appearance of the excrement on the following day showed that the intestine had been injured. He was confined in his diet to broth with an egg, which was discharged through the wound between one and two hours after being swallowed. He felt extreme hunger, and was clandestinely supplied by a fellow-soldier, at the end of ten days, with bread and meat, which he devoured greedily, and retained for ten hours. After the wound had cicatrized, and he had left his bed, two protrusions of the bowel took place, and gradually increased to the length of a span. These are connected at their bases, so that they resemble one gut, joined by its broadest part to the belly, and having two loose dependent extremities. They return into the abdomen, when he lies on the right side; and can be very readily pushed up, by introducing the finger into the aperture at their extremities: but the inferior prolapsus does not ever enter completely. When they are replaced, a large opening under the lower ribs leads into the cavity of the colon; and from this the contents of the canal are discharged frequently

* Cent. i. obs. 74.

† ALBINI Annotat. Academ. lib. ii. cap. viii. *De vulnere intestini coli, et quæ id consecuta sunt.* The minute and interesting narrative of this case was drawn up from ALBINUS's own examination, and the history furnished by the patient. A very good representation of the appearances is given in two figures.

and involuntarily ; less so, however, when the bowel falls down, as the pressure of the cicatrix then retains them in some measure. If he continues in the recumbent position, or if he rises and remains very quiet, the gut does not descend ; but coughing or any exertion renews the protrusion. The tumours are red, turgid, and covered with mucus ; they become paler, flaccid, and wrinkled, when about to pass up. They possess several wartlike prominences, rough, covered with a kind of mucous coat, bleeding when rubbed, disappearing and renewed again in different situations. At one time exposure of the part to cold did not affect it ; he had washed it in the waters of the Rhine, when the river was frozen, without inconvenience : latterly, however, cold air coming in contact with the protrusions caused cough. If he did not wash it often enough in hot weather, and was engaged in laborious exertions, a dark and hard mucous and bloody incrustation took place, with pain, loss of appetite and strength ; by lying in bed on the right side, the protruded parts would gradually return, and the pellicle could be easily removed, when they again came down. He had married, and got children : he was robust, when ALBINUS examined him, in the fortieth year of his age. A white mucus was discharged almost daily per anum ; and sometimes, particularly if he retained the protrusions within the cavity, a thick tenacious white matter came away with considerable difficulty. He enjoyed the best health when he ate a sufficient quantity to satisfy his appetite. Bread and meat, with a little strong beer, agreed with him best : they were retained nine or ten hours, and always underwent considerable alteration before they were discharged. Bread made of fine flour was the best. Ripe fruits, leguminous, and other fresh vegetables, were hardly retained two hours ; they were discharged nearly unchanged, sometimes without loss of colour ; and not mixed with the other food. But if much fat or butter were taken with them, they would stay longer : even for three days, in some instances. When he drank too much, the protrusion swelled, and much air and liquid came through the superior portion with the excrement : and liquids taken without solid food would run off in less than two hours."

CASE V.*—"After the removal of a portion of colon, in a case of hernia with mortification, an artificial anus remained,

* See the Memoir of SABATIER already quoted, p. 618.

through which all the feces were discharged, excepting some whitish hardened portions, which are still expelled every two or three months. At the end of about eight weeks the intestine protruded through the wound, and a second protrusion appeared in a few days. They were two or three inches in length, and fifteen or sixteen in diameter; and have remained of the same size. Their colour is a deep red, and the surface irregular. They can be easily replaced, without any pain, but the slightest effort is sufficient to renew the protrusion, particularly in the erect position. Clysters injected per anum pass out immediately through the portion which projects from the lower extremity; and *vice versa*. Messrs. SABATIER, DE LA MARTINIERE and ANDOUILLE', to whom this person was referred, for the purpose of ascertaining whether a cure could be accomplished, advised him to be contented with palliative measures. He wears a truss with a pad made of box-wood, which confines the protuberance next to the anus. The upper prominence passes through an opening formed in the pad; and a silver tube continued from this aperture conveys the excrement into a box of tin."

The valuable memoir of SABATIER,* from which I have extracted three of the preceding cases, contains two instances related by Mr. PUY of Lyons, in which strangulation of the protruded intestine led to a fatal termination. Unfortunately the parts were not examined after death. The same occurrence was fatal to a patient, whose case is quoted from FLAJANI, in the next section, *on fecal fistula*.

We should endeavour, in cases of artificial anus, to prevent the occurrence of prolapsus by pressure on the part; and this is more particularly necessary, when a disposition to its formation appears to exist. If the tumour has become irreducible by the hand, its replacement may be attempted by keeping up constant pressure, while the patient is confined to bed. When it cannot be lessened by this treatment, some contrivance may be adopted to prevent its future increase; and the patient should avoid great exertions, laborious exercise, irregularity of the bowels, and all other causes likely to augment the swelling. Where pressure by the cicatrix threatens to interrupt en-

* Pp. 622 and 623. See also a fatal case in LE BLANC, *Operations*, tom. ii, p. 445.

tirely the course of the feces, an attempt at relief should be made by dividing the stricture.*

An instructive instance of prolapsus is related by SCARPA ; it occurred in the patient whose case is quoted in this chapter, at p. 374, to illustrate the treatment of hernia, where the intestine has mortified. Having remained well for three years, “ he was attacked with violent cough, which troubled him incessantly for several months ; after this the small aperture in the centre of the cicatrix began to enlarge, and then to discharge a greater quantity of feculent matter than usual. Afterwards a small red tubercle protruded at this hole, which gradually increased, so as to form a tumour two inches and a-half long, and in breadth equal to such a portion of inverted small intestine. In proportion as this reddish tumour became longer, and projected outwards, the alvine excretions were diminished, and were at last totally interrupted. The patient returned to the hospital in this state. I did not find any difficulty in returning completely the inverted intestine ; I then introduced into the fistulous canal a tent of linen about the size of the finger, an inch and a-half long, which was directed towards the left side. A few hours after the introduction of the tent, the patient, to my great astonishment, repeatedly went to stool, in spite of the presence of the tent in the fistula, and without previous pains in the abdomen of any consequence. I continued to apply the same dressing for a week, after which I removed the tent, and only placed a common pledget opposite to the orifice of the fistula, trusting that the fistulous canal, when left to itself, would have again contracted so much, as to prevent the inversion of the intestine, as it had done the preceding years. But the case terminated differently ; for although the patient was kept constantly in bed, used daily three or four clysters, sometimes stimulant, sometimes emollient, and occasionally a gentle purgative, and was no longer troubled with the cough, yet the fistula did not contract, the alvine discharge again became scanty, and the intestine was inverted outwardly, as before.” The use of the tent produced the same effect as on the former occasion, and it was necessary to wear it constantly. A compress, supported by a T bandage, was found the best means of keep-

* This was successfully practised in an instance recorded by SCHMUCKER, *Chir. Wahrnehm.* b. ii.

ing the tent in its situation. The patient continued to wear it for two years, and went about his ordinary affairs.*

When the prolapsus has been reduced, the case comes under the description of simple artificial anus, and may be treated according to the principles explained in the preceding section.

SECTION VII.—FECAL FISTULA.

The wound sometimes closes in a case of mortified hernia, with the exception of a small fistulous aperture, through which fecal matter, or a yellow fluid, is discharged in small quantity. Such openings often continue in spite of every attempt to heal them. The complaint differs from the artificial anus only in degree. The stools are evacuated in the natural way, but a small opening still exists, giving issue from time to time to more or less of the intestinal contents. The discharge may be abundant at one time, and then stop for some days: the opening may be closed for a time, and then re-appear. The matter discharged may be a clear yellow fluid, without any fecal smell.

Herniæ are not the only causes capable of producing these fistulæ; they may arise also from wounds of the intestine, or after those abscesses through which worms or other extraneous matters are occasionally discharged.

A lady was under my care for two years on account of fistulous openings in the thigh, giving issue occasionally to the contents of the intestine. She had been the subject of crural hernia, which had mortified while she was travelling in Germany, and had required an operation and treatment, of which I could not make out the exact particulars. There was a small opening on the anterior part of the limb, two inches below the crural arch, and another on the inner side, about midway between the anterior and posterior aspects of the thigh, with much thickening and hardness of the surrounding textures. These fistulæ discharged

* M. iv. § xix.

from time to time, generally in small quantity, a yellow fluid, either of watery consistence, or like thick pease-soup, with bubbles of air, but free from fecal odour. I tried, but without success, all the means I could think of for closing these openings; such as compression in various modes, injections of astringent and irritating fluids, the free use of the nitrate of silver in substance, slitting up the sinuses, together with the greatest attention to diet and the state of the bowels. The anterior opening remained closed, on one occasion, for nearly three months, and then ulcerated again: and the discharge of feces sometimes ceased entirely for four, five, or six weeks, and then recurred. The bowels were easily regulated, and the evacuations were natural: the appetite, strength, and health were good. This lady was subject to inflammatory attacks in the seat of disease, preceded by pain, and accompanied with swelling, redness, and heat. On these occasions, the openings, if previously contracted or closed, enlarged, and the intestinal contents flowed in increased quantity.

"I attended a patient," says MORAND, "in whom the operation for strangulated hernia had been performed; and who voided feces both by the wound and the anus. The discharge by the former passage was gradually reduced to a little yellow serum, (*serosité bilieuse*,) which the patient continued to pass through a small fistulous opening. I have seen two other instances of the same kind."*

In the case of a female, who had a ventral hernia, from which a portion of intestine sloughed, "the wound has since several times healed; but at the interval of a month, and sometimes of six weeks, an abscess forms, and produces a discharge of purulent and feculent matter for four or five days, when the wound again closes; and in this way she has been teased for many years."†

"A boy, aged thirteen, was admitted into St. Thomas's hospital for an irreducible scrotal hernia, from which a quantity of feculent matter was constantly discharging through a small hole in the scrotum. He remembered having accidentally swallowed a pin, and five weeks afterwards his hernia began to swell, and to become very painful. A poultice was applied, and an abscess formed, which

* *Opuscles*, pt. ii. p. 162.

† COOPER, part i. p. 38. Another case may be seen in DE HAËN, *Ratio Medendi*, p. 7, cap. iv. § xix.

soon after burst, and on looking at the orifice by which the matter had discharged, the point of a pin appeared projecting from it, which was easily extracted. A fistulous opening of the intestine remained, for which he was admitted into the hospital. Attempts were made to unite it, by paring off the edges of the wound, and encouraging adhesion, but without success.”*

A woman, fifty-eight years of age, was admitted into the hospital of the faculty at Paris, under M. BOUGON, on account of an inflammatory tumour in the right iliac region, of fifteen days' duration, accompanied with pain and fever. The patient, who was habitually costive, had passed stools from time to time. The swelling broke, and discharged a large quantity of stinking pus, mixed with air, mucus, and feces; subsequently there came away an angular fragment of bone, seven lines in diameter, which seemed to have belonged to the head of a fish. At the end of twenty days, there was a fistulous opening three or four lines in diameter, through which matters escaped from the intestine. This had closed on the forty-third day; and the patient continued perfectly well at the end of four months.†

A scrofulous girl of seventeen, who had never menstruated, became a patient of M. VELPEAU, in the hospital La Pitié, in October, 1833. In the preceding May a swelling had formed near the navel, and had been opened, giving issue to very fetid matter. Other openings subsequently took place spontaneously near the first. These led to a large excavation under the integument, which was freely exposed by M. VELPEAU in December. Eight days after feces came through the wound; and, although there were natural stools, some discharge continued through the fistula, until the patient's death, which happened in March from phthisis. There was an ulcerated opening in the ileum, leading through a wound more than an inch long, to the parietes of the cavity near the inguinal ring, from which the contents of the intestine had made their way upwards to the neighbourhood of the navel. There was no obstruction in the intestine.

M. VELPEAU had, at the same time, under his care in the hospital, a youth of seventeen, named JULES COSTIN, who had been for several months under the care of M.

* COOPER, part i. p. 17.

† *Journal Hebdomadaire*; Juillet, 1836.

LOUIS for symptoms of intestinal ulceration. To the right, and a little below the navel, there was a fistulous ulcer, through which some fecal matter and wind escaped every day; it had been preceded by a large abscess. The discharge of feces by the natural passage had never been completely interrupted. The health was in other respects good. M. VELPEAU opened a long sinus which led to the right iliac fossa, and was thus enabled to introduce his finger into the bowel, which he concluded to be the cæcum or ascending colon. Fluids thrown into the canal in the shape of clyster soon came out at the preternatural opening; and articles of food were discharged in an equally short time. When the opening was closed with linen, charpie, sponge, or cork, the patient passed his motions naturally; but, if the plug was removed, the intestinal contents came through. Repeated efforts to close the opening, by means of suture, simple and twisted, and autoplastie three times repeated, were altogether unsuccessful. A valve felt at the bottom of the opening was also destroyed by the entérotoûme of DUPUYTREN without any better result. The patient left the hospital in 1834, trusting to a plug for closing the opening, and being in good health.*

In treating these fistulæ, we should endeavour, by accelerating the passage of the intestinal contents, to obviate accumulation in the canal; while the preternatural opening should be so closed as to prevent the introduction of any matters into it. The use of laxatives, combined with clysters, and the employment of easily digested food, will accomplish the former object, and determine the feces towards the anus. Pressure on the fistula, by means of graduated compresses, supported by an elastic truss, fulfils the second indication. Confinement to bed should be insisted on; and there is every reason to expect that this plan, if steadily pursued,² would prove effectual in most cases. Methodical compression will at least prevent serious inconvenience from escape of matters through the fistula.

Attempts have been made repeatedly, by DUPUYTREN and others, to close fecal fistulæ by sutures of various kinds, but hitherto without success. VELPEAU endeavoured to accomplish the same point by means of *autoplastie*;

* *Journal Hebdomadaire*; Juillet, 1836.

that is, by borrowing a portion of integument from the neighbourhood of the opening, and fixing it to the margins of the fistula previously pared. He tried this plan in the case of COSTIN already related. See *ante*, p. 425. In the first instance he detached the integuments to the extent of an inch all round, pared the edges, and then brought them accurately together by sutures. Fecal matter soon found its way between the integuments and the subjacent parts; and it was necessary to remove the sutures on the third day, the opening being larger than before. He then raised a portion of integument from above the opening, as in the operation of forming a new nose from the forehead, and fixed this by means of sutures to the newly pared edges of the fistula. Yellow fluid and air escaped at the intervals of the sutures on the second day, and the borrowed flap of skin mortified. M. VELPEAU lastly employed the *cutaneous plug* which he had resorted to with success in two cases of laryngeal fistula. He took a portion of skin from the side, doubled it on its external or cuticular surface, and pushed it into the opening, fixing it there by means of four sutures. There was a fecal oozing the next day; and the borrowed portion of skin mortified as before. The credit due to resolute perseverance must be awarded equally to the patient and surgeon in this troublesome case; for the unsuccessful attempts just specified were made after the previous failure of the quilled suture.*

Not discouraged by the unfavourable result of these trials, M. VELPEAU repeated the use of the suture in another case, under a mode of proceeding slightly modified, and mentioned by him as a *new method*. It failed, like the preceding attempts; although the fistula subsequently contracted, so as to prevent the intestinal contents from escaping,

CASE.—A patient, twenty-seven years old, had an opening in the right groin, with discharge of fecal matter for four years: it had taken place after an inflammatory swelling of the integuments covering an inguinal hernia. The fistula was above POUPART'S ligament, and opposite the upper opening of the inguinal canal. The cæcum was

* VELPEAU, *Mémoire sur les anus contre nature, dépourus d'éperon, et sur une nouvelle manière de les traiter*; in the *Journal Hebdomadaire des progrès des sciences et institutions médicales*; Juillet, 1836.

probably the part of the intestine communicating with the fistula; for the finger entered a large cavity; the discharge consisted of well-formed fecal matter; clysters occasioned efflux from the fistula, and the patient was well nourished. M. VELPEAU made an elliptical incision, so as to remove the callous edges of the fistula, cutting obliquely, and not taking away any part of the intestine. The edges of the wound thus made were accurately united by sutures. Then, in order that there should be no dragging on the part thus united, he made two semilunar incisions, two inches and a half in length, one on each side, with their concavity towards the fistula, and distant from it twelve or fifteen lines. These were carried through the integuments and the aponeurosis of the obliquus externus. It was necessary to cut the sutures on the third day; and the discharge through the opening was renewed. This began to diminish in a month, and ceased in another fortnight. It does not appear from the narrative that the fistula closed and cicatrised; nor does the history quite include three months from the time of the operation.

The occasional discharge of coloured mucus is not the only evil to which patients with fecal fistulæ are exposed. Prolapsus of the bowel through the aperture may occur from straining, injury, constipation, or other disorder of the canal; and, as the opening is small, the protruded bowel may easily become strangulated. Such a case occurred to FLAJANI. "BERNARDINO FACCHINO had undergone the operation for bubonocoele eighteen years since; a small fistula remained, through which a part of the feces passed: one morning, whilst making repeated efforts to expel his feces without the truss, which he constantly wore, he perceived the passage of a portion of the intestine through the fistula, and it increased in proportion to his efforts. Vomiting and fever ensued; and he entered the hospital the following morning. I found a portion of small intestine, eighteen inches in length, livid and flaccid, protruding from the fistula; the belly tumid; pulse irregular, extremities cold. I endeavoured to introduce a probe-pointed knife and to dilate the aperture, but this was not possible. The symptoms continued, and in a few hours he died. On examination, a portion of the colon was found adherent to the opening, where it formed a sort of funnel. A piece of the ileum was fixed in the

opening of the fistula. At the part which was inverted it adhered so firmly, that I could scarcely separate it with my hands.”*

The case quoted from SCARPA, at p. 422, illustrates the same point.

* *Collezione d'osservazioni e riflessioni, &c.* tom. ii. quoted in the *Quarterly Journal of Foreign Medicine*, No. x.

CHAPTER XIII.

OMENTAL RUPTURES.

THE situation of the omentum in the front of the abdomen, between the parietes and the most moveable portion of the intestinal canal, accounts for its being frequently protruded in ruptures, especially in the more common forms of the complaint, which take place on the anterior aspect of the body, as in the umbilical and inguinal; for its being seen more frequently in the former than in the latter, and in both these than in the crural; and for the circumstance of its being usually found in front, when the swelling contains both intestine and omentum. Its position and connexions explain also why it is not met with in ruptures occurring below the superior aperture of the pelvis. It may be protruded in diaphragmatic herniæ, being generally carried into the chest, in those cases, by its attachments to the stomach and colon.

It has passed out at the abdominal ring, and under the crural arch of the same subject; at the ring and navel; and at both rings. I have seen it in a double scrotal rupture, at the very bottom of the scrotum on both sides.

It is said to hang rather lower on the left than on the right side, and consequently to be found more commonly in left than in right ruptures. "The omentum," says SCARPA, "descends more frequently into the left than into the right groin. This remark, made formerly by VESALIUS and by RIOLAN, has been since confirmed by surgeons of great experience in the treatment of ruptures, especially by ARNAUD, who has not hesitated to assert, that of twenty inguinal epiploceles nineteen will be found on the left side."*

* *Sull'ernie*; Ed. 2, p. 31.

Dr. MACFARLANE rightly observes that this statement of ARNAUD is much exaggerated: he adds “were I inclined to hazard an opinion on this point, I would state, as the result of my own experience, and of the published cases of this disease, which I have read, that in about three-fourths of the cases, the epiplocele will be found in the left groin.”*

The omentum is imperfectly developed and short, so as not to reach much beyond the umbilicus in infants; larger and longer, descending even into the pelvis in adults and old persons. Hence the comparative infrequency of inguinal epiplocele in the former case.

Dr. MACFARLANE† saw an inguinal epiplocele of the left side in a very young child.

Omental herniæ are often small, and generally of moderate size. They are hardly susceptible of that great enlargement which intestinal ruptures sometimes attain. The latter are augmented by the successive descent of fresh portions: while omental ruptures must increase principally by accumulation of fat in the protruded part. In this way they sometimes attain considerable magnitude in elderly and corpulent persons. I have seen the omentum in an old umbilical epiplocele, forming a mere lump of fat equal in size to two fists. SCHMUCKER‡ mentions instances, where it has constituted in this manner masses of twelve ounces and a pound and a half in weight. Dr. MONRO§ speaks of a specimen in the University of Edinburgh, in which the protruded portion forms a hard mass weighing two or three pounds. POUTEAU|| gives a case, where forty-five ounces were removed in the operation; and ARNAUD¶ mentions an instance, in which it formed a mass of eight pounds, thirteen ounces in weight, in an exomphalos.

Reducible omental hernia.—The tumour is soft, doughy, and compressible; unequal on the surface; without tension or elasticity; elongated or pyriform, rather than rounded; perfectly indolent, so that it can be handled freely without causing pain, and generally presenting, on careful examination, some differences of consistence, as if the swelling were

* *Remarks on omental hernia with cases; Medico-chirurgical transactions; vol. xvi. p. 238.*

† *Ibid.*

‡ *Vermischte chirurgische Schriften; v. iii, p. 197.*

§ *Morbid anatomy of the gullet, &c; p. 383.*

|| *Ouvrages posthumes; vol. iii., p. 173.*

¶ *Mémoires de chirurgie; tom. ii. p. 416.*

made up of firmer and softer portions. Its characters, as compared with those of an enterocele, and the different mode in which the parts pass back into the abdomen, in the two cases, are considered in CHAPTER III.; see *ante*, p. 50.

When the protrusion is small, its outline is ill defined, and the case may be considered a swelling or fulness of the spermatic cord. The collections of fat occasionally found in the latter may, on the other hand, be mistaken for omental ruptures. The latter are liable to be confounded with other affections of the cord, particularly with varicocele and diffused hydrocele. The diagnostic marks of the various diseases in this region are pointed out in CHAPTER X.; see *ante*, p. 249—254.

As the omentum is less highly organised, and much less complicated in structure than the intestine; as its function, whatever that may be, cannot be compared in importance and general influence to that of the bowels; and as it is comparatively insensible, the inconvenience and danger of an epiplocele have been generally represented as less considerable than those of an intestinal rupture: this view is just, to a certain extent, in respect to the reducible form of the complaint. This apparently harmless state may, however, be exchanged at any moment for that of strangulation, in which the patient's danger is little less than if the rupture were intestinal. The omentum has for the basis of its structure a serous membrane continuous with the peritoneum, of which it is a mere modification, liable to the same diseases and subject to the same morbid changes. It is susceptible of inflammation, suppuration, and mortification: these changes, being propagated from the protruded portion to the general mass, and exciting inflammation in the contiguous parts and surrounding peritoneum, bring the patient immediately into the greatest danger. In these respects omental ruptures are at least as formidable as the intestinal.

The connexion of the omentum to the stomach and colon is a source of great suffering, especially when the tumour is large and irreducible; it drags on those viscera, particularly when they are distended after meals, causing indigestion, nausea, sickness, want of appetite, colic, and various uneasy feelings, which sometimes can only be relieved by bending the trunk forwards. Since a small rupture may occasion such symptoms, careful examination of the abdomen is necessary in obstinate affections of the viscera.

Further, when the mouth of the sac is kept open by the presence of omentum, a portion of intestine easily slips out by its side. A person with an epiplocele is thus constantly subject to an additional descent of the bowel, and is therefore always liable to the sufferings and risks which belong to an intestinal rupture. Intestine thus protruded generally experiences more or less pressure, causing pain, nausea, and sickness. The various evils incidental to such occurrences, when they take place frequently, have been found so insupportable, that patients have sometimes undergone the risk of life, in the dangerous operation of opening the sac, and removing the adhesions, for the chance of obtaining relief.*

To guard the patient against the various inconveniences and dangers just pointed out, the protruded omentum should be returned as quickly as possible, and it should be confined within the abdomen by means of a truss. An additional reason for early reduction is found in the circumstance, that it readily contracts adhesions to the sac, so as to become irreducible. As it comes out again easily, a stronger spring is generally required than for an intestinal rupture; and difficulty is often experienced in accomplishing the point.

The omentum, although insensible, will not bear the application of much force; we must therefore avoid such pressure as might lacerate or bruise it. "I have seen," says Dr. MACFARLANE, "one case, in which, from continued and powerful efforts at reduction, the omentum was lacerated in several places; and in another the protruded part was livid and ecchymosed, from the extravasation of blood into its cellular texture. The contused omentum, instead of being excised, was, unfortunately, returned into the abdomen, became gangrenous, and produced death."†

Another case related by Dr. MACFARLANE shows us that serious and even fatal consequences may result from trivial injuries, when the disorder which they excite is propagated by continuity of surface and affects the omentum within the abdomen. A female with ascites, who required tapping, had been affected with reducible exomphalos. The fluid was evacuated by puncturing the tumour; the thinness of the integuments, and the transparency of the part when viewed with a candle being favourable to the proceeding. In

* See *ante*; p. 120.

† *Ibid.* p. 243.

eight hours after the operation uneasiness in the region of the stomach, nausea, and faintness came on : vomiting soon followed, and continued with little interruption. The pulse was small, weak, and indistinct, the extremities cold, the tongue white and dry, the thirst urgent. The pain was trifling, not increased by pressure, confined to the umbilical and epigastric regions. Before death, which happened the sixth day, hiccup came on, with occasional delirium. The omentum, about an inch and a half from its inferior margin, was fixed by old adhesions to the upper edge of the umbilical opening. The loose portion was dark red, and exhibited a triangular opening, which had been made by the trochar. The rest of the omentum, to within half an inch of the stomach, was livid and gangrenous. There were a few patches of inflammation on the intestines, which the omentum covered, but in no other situation.*

Irreducible epiplocele.—A small omental hernia often produces little or no inconvenience ; the complaint is neglected, the tumour enlarges and soon becomes irreducible. Adhesions frequently form between the omentum and the sac, either in the shape of threads, or bands of various size, length and number, or of close connexions which become at last so firm as to admit of separation only by the knife. An attack of inflammation sometimes causes these adhesions, which in other cases are formed without any local symptoms.

In a rupture of a mixed kind, or where a portion of intestine is forced down into an epiplocele, the bowel may be compressed by adherent omentum, or it may become entangled with a cord or band, and thus suffer strangulation.† See *ante*, p. 309.

Of all the parts, which form the contents of herniæ, the omentum is found to deviate most frequently from its normal state. Indeed it seldom possesses a perfectly natural structure, when it has been long inclosed in a hernial sac. The pressure of the opening consolidates the part which occupies the ring, converting it at last into a smooth, round, and firm mass, while the portion below retains its natural texture and appearance more or less completely. In some cases it has been almost separated from the abdominal cavity by the pressure of a truss : such instances may have given rise to the observations, in which individuals have been said to possess three testicles.

* *Ibid* p. 279.

The part below the ring, although it can be unfolded, generally becomes thickened and firmer to the feel in the course of time. Sometimes portions are indurated; sometimes the whole protrusion forms a firm smooth body. The part below the ring is often simply enlarged, especially in fat persons, exhibiting the state of hypertrophy; sometimes it is converted into a fatty mass, which cannot be unfolded, and exhibits hardly any traces of the original structure.

The change of figure connected with these alterations; the enlargement of the omentum in the sac, with its contraction and consolidation in the ring, must form an insuperable obstacle to reduction, independently of adhesions. Simple irreducibility therefore does not prove that the omentum has become adherent. Dr. MACFARLANE dissected "a large inguinal epiplocele of the right side, which had been irreducible for fourteen years. Many ineffectual attempts were made during the patient's life to return the parts into the abdomen; and the failure was attributed more to the supposed existence of firm and extensive adhesions, than to the size of the tumour. It was ascertained, after death, that no part of the omentum was adhering to the sac, but it was so enlarged and disorganised, that reduction could not be accomplished until the inguinal ring was divided for nearly three inches."*

Dr. MACFARLANE attended another patient in January, 1829, with violent pain in the abdomen, extending from the left groin to the epigastrium, nausea, vomiting and constipation. The only relief which could be obtained from severe pain was by bending the trunk and thighs. A doughy rather painful tumour, about the size of a hen's egg, was discovered passing from the left inguinal canal, by a hard and narrow neck. This tumour had existed nearly twenty years, and often became painful, occasioning smart attacks of colic and vomiting. Bleeding, leeches, fomentations, purgatives and clysters were employed for three days before the bowels were freely opened, or the urgent symptoms relieved. The pain gradually subsided, but the tumour remained undiminished. When the patient was seen again in March, 1830, the tumour had become larger than at first, and was pyriform. It caused great uneasiness by its bulk and weight, and by dragging on the stomach in the erect attitude. A suspensory bandage and spare diet were recommended to the patient, who had become corpulent. "In

* *Ibid.* p. 248.

the following month he had an attack of fever, by which he was confined for six weeks, and of course greatly emaciated. When convalescence took place, I was surprised to find the tumour so much reduced below its original size, that I was enabled by very moderate pressure for a few minutes to return it fairly into the abdomen. A truss was afterwards applied, and the return of the disease prevented.”*

The induration of the omentum has sometimes proceeded to such an extent, that it has been described as scirrhus and cancerous. It is occasionally found of scirrhus hardness, but I have never seen it of scirrhus structure; and I therefore regard these epithets as merely denoting the degree of induration. In a patient with double scrotal hernia, seen by Mr. POTT, the swellings were of unequal surface, craggy, and incompressibly hard. They were not painful on pressure; but handling made them painful for some time after. There were attacks of acute pain darting through the belly, attended with nausea and inclination to vomit. He had been subject to painful colic, generally attended with constipation; and found the erect position if long continued, very irksome. The swellings had been originally soft and reducible: he had neglected the use of the truss, and had not been able to return them for the last two years. The complexion was sallow, the pulse weak and irregular, the urine scanty. Not long after, this patient died of dropsy. There was a hernial sac on each side; and “in each of these was a hard, knotty, irregular kind of body, whose surface was covered with varicous vessels. These bodies passed from the cavity of the belly, through the openings in the abdominal muscles, were continuations of the omentum, and were truly cancerous.”†

A mass of indurated omentum pressing on the intestine may obstruct it and thus cause symptoms like those of incarceration. In a patient, on whom Mr. POTT operated for scrotal hernia on the fourth day of constipation, the sac contained “a large piece of omentum or rather of what had been omentum, but which was now hardened into a large flat cake, as incompressible as cold bees-wax, and about the size of a large mangoe; it distended all the upper part of the sac, and was adherent to the lower part of it: behind this large body lay a portion of the ileum, and below this, that part of the colon which is annexed to it: the colon was

* *Ibid.* p. 250.

† *Works*, vol. iii, p. 251.

considerably distended with flatus, and the ileum was so wedged in and pressed by the altered omentum, that nothing could possibly pass through it. When the portion of omentum was removed the tendon made so little stricture on the gut, that had it not been for the great distension of the colon, it might have been returned into the belly without division.”*

A patient with irreducible epiplocele is not only troubled by the swelling, but exposed to the risk of much more serious inconvenience and suffering from disorder of the functions of the stomach and colon, probably arising from the dragging of the protruded portion on those viscera. Where a considerable protrusion has existed, we find the omentum after death in a triangular form, the apex being a thick and round cord entering the hernial sac, the basis being its attachment to the stomach, while the viscus is drawn more or less tightly, between those points, and sometimes thrown into folds which converge below. The stomach and colon are sometimes drawn out of their situation. We cannot therefore be surprised that patients with omental ruptures should suffer from indigestion and colic; that they should occasionally experience pain in the stomach, nausea, and sickness, pains in the bowels, more especially when the stomach is distended with food, or the tension of the omentum is increased by costiveness or the enlargement of pregnancy; that they should be troubled with flatulence and constipation; that their sufferings should be aggravated in the erect and mitigated in the bent position of the trunk. Cases are even recorded where the patient has not been able to take more than a moderate quantity of food without bringing on vomiting; and even where it has been necessary for all the meals to be taken in the recumbent position with the trunk curved and the thighs bent.”†

“A few years ago” says Dr. MACFARLANE, “a woman about twenty-eight years of age, who came under my care for a different disease, had a considerable irreducible crural epiplocele of the left side. She had experienced for several years attacks of dragging at the stomach, vomiting, and constipation; but these were mild, when compared with the violent, incessant, and distressing attacks to which she was

* *Ibid.* p. 256.

† GUNZ, *obs. anat. chir. de herniis. Mémoires de l'académie de chirurgie*; tom. iii. p. 406.

subject after she became pregnant. As the abdomen became more and more prominent, the severity of the symptoms increased. During the last two months of pregnancy, she was constantly confined to bed, and only experienced relief when she lay on her left side, with the trunk bent forward, and the thighs drawn up to the abdomen. She could not extend herself in bed, nor assume an erect position without immediately exciting vomiting and pain in the stomach. The relief she experienced after delivery was very decided.”*

In another case, observed by Dr. MACFARLANE, an omental protrusion was the source of great suffering by disordering the stomach and bowels. A healthy unmarried woman, twenty-six years of age, was suddenly seized, while lifting a heavy piece of coal, with acute pain in the right groin and belly. In the course of three hours the pain had extended considerably, vomiting had occurred, and the pulse was accelerated. A defined tumour, of the size of a walnut, smooth and painful, but not tense occupied the site of the right crural opening. The abdomen was not tumid, but pressure in the neighbourhood of the tumour could scarcely be borne. In the course of eight or ten hours the bowels were opened by a dose of castor oil. The vomiting and pain gradually subsided, but the tumour continued tender, undiminished, irreducible. From this time her health became impaired, and she experienced frequent attacks of dragging pain in the abdomen, vomiting, colic, and constipation. She attributed all her sufferings to the tumour, which at the end of seven years was of the size of a pigeon’s egg, with an irregular doughy feel, and was immovably fixed in the situation of the crural opening. As pressure excited acute pain, the effect of a truss with hollow pad could not be tried.†

Inflammation of the omentum in a rupture.—The omentum in a rupture may be attacked with inflammation, which may either terminate in resolution, or proceed to suppuration and gangrene. The disorder may be confined to the rupture, or extend to the cavity of the abdomen. The affection is always of a serious character, sometimes dangerous; and has terminated fatally in some instances; or, if it does not end in resolution, the most favourable result is the formation of an abscess, from which pus is discharged,

* *Ibid.* p. 254.

† *Ibid.* p. 243.

alone, or together with portions of the mortified membrane.

PETIT had seen, in many cases, gangrenous abscess of the omentum from the pressure of trusses, and mentions two instances.

CASE.—A young butcher bought a truss and applied it for himself. His rupture, which had not gone up completely for seven or eight months, was considerably diminished in five or six days; and he thought by tightening the truss he might obtain a more speedy cure. The increased pressure occasioned inflammation and pain, and he sent for me. In spite of bleeding, poultices, and other means, suppuration ensued. I opened the abscess, which was accompanied with gangrene of the omentum; part of the sac also had mortified. The discharge was so abundant that we feared it came in part from the abdomen: this however lessened; the sloughs separated; the ulcer became clean, and soon cicatrised.”

CASE.—“A lady with exomphalos pursued the same course: she even added a thickness of two inches to the pad of her truss, and kept it equally tight. At first there was no pain: the tumour diminished, and she thought she might draw the bandage tighter. In a day or two the belly became painful; the integuments swelled around the part compressed by the instrument, which she loosened, and then sent for me. The integuments were œdematous, except at the swelling, which was red, shining, hard, and painful; there was a depression showing where the truss had been applied. Repeated bleedings were employed, but suppuration and mortification ensued. I made an opening and let out a few ounces (un demi-septier) of putrid matter, intolerably fetid. The patient was immediately relieved; the sloughs separated, the wound went on favourably, and was cicatrised in about a month, the rupture being radically cured.*

The following cases, related by Mr. POTT, show that peritonitis, suppuration, mortification of the omentum, and death, may result from the pressure of a truss.

CASE I.—*Peritonitis from the pressure of a hard bolster and tight bandage on an irreducible epiplocele.*—A gentleman who had worn a truss for a reducible omental hernia, discontinued it, and left the complaint to its own course.

* *Traité des mal. chirurg.* tom. ii. p. 302—304.

Being obliged to go a journey on horseback, he thought it prudent to put on the truss again, but could not push up the part; nor could Mr. POTT return it, although it was merely a portion of omentum, and that not large. He now went to an advertiser, who put on a large hard bolster, buckled it tight, and told him he might go on his journey, adding, that long before his return the portion of caul would be shrunk to nothing, and the disease cured. When he had travelled about twenty miles, he was in great pain and very ill, and thought it best to return to London, which he did with difficulty.

“ I found him,” says Mr. POTT, “ in extreme pain all over his belly, which would hardly bear being touched; he was incapable not only of sitting or standing upright, but even of lying straight on his back; he could hardly bear the weight of the bedclothes; and even the gentlest pressure towards the bottom of his belly and groin was intolerable. The scrotum and spermatic cord, on the ruptured side, were swollen, tense, and inflamed; the skin hot and dry, the pulse hard and frequent; and he had such a degree of restlessness, that although motion was very painful to him, he could not lie still for two minutes. Notwithstanding the many opportunities which, before this accident, I had had of knowing the true nature of his rupture, and that I was perfectly convinced that it had always been omental merely, yet from his acute pain, from the enlarged and inflamed state of the cord, and from the nature and rapidity of his symptoms, I was much inclined to believe that a portion of intestine had some share in the present mischief: but the patient, who was a very intelligent man, insisted on it that it had not, and that all his present malady was caused by the pressure of the truss on his omentum.” Attempts at reduction by the hand were quite out of the question; the means resorted to were large bleeding, a purging mixture, and a clyster. The bowels were soon copiously relieved, but without diminution of the inflammatory symptoms. Further bleeding was employed; and the warm-bath was recommended, but the patient could not use it from fear of aggravating by motion his pain, which was still severe. An injection containing laudanum was therefore administered, with two grains of opium by the mouth. He passed a bad night, and was glad to employ a warm-bath the next morning; by the repeated use of which, with mild aperients, he became easy at the end

of four days. The swelling of the groin and scrotum subsided, leaving the parts as they had been before this occurrence. On examining this gentleman, who died two years afterwards, the case was found to be an epiplocele, the omentum adhering to the sac, by its lower edge, in two places.*

CASE II.—*Mortification of the omentum and hernial sac from the pressure of a bandage.*—A gentleman who had worn for several years a steel truss for a rupture always considered omental, laid it aside and put on a dimity bandage with a large bolster, which he had worn very tightly buckled. Mr. POTT found him with the groin and scrotum much swelled, and so painful that the taxis could not have been borne; he had been constipated for two days, and was hot and feverish. Blood-letting, aperients, clysters, and ultimately the tobacco enema, which produced its full effects to an alarming degree, were employed, but without producing any discharge per anum: three days were thus employed before the patient would consent to an operation. When this was at last performed, the integuments and sac were gangrenous; and a considerable quantity of most offensive sanies issued from the latter, with a large putrid slough, which appeared to have been a part of the omentum. The abdominal ring was in a natural state, and no portion of intestine was engaged in it. Another day passed without a motion, the patient's state being hopeless; but on the following or fifth day, the bowels were freely opened, with relief of the most troublesome symptoms. The sac was long in an unfavourable state; but the patient at last recovered.†

CASE III.—*Death from mortification of the omentum, caused by the pressure of a bandage.*—A young man with a large irreducible epiplocele, was recommended by Mr. POTT to wear a suspensory bandage, and followed this advice for six months. Being then about to marry, and wishing to get rid of the complaint, he applied to a person, who put on a tight bandage, and desired him to wear it night and day. When he had worn it three days, he could no longer endure the pain, and took the bandage off. Inflammation and swelling of the part, with serious indisposition, came on, and he was at last brought to ST. BARTHO-

* *Observations on ruptures; in Works, vol. iii. p. 239.*

† *Ibid. p. 247.*

LOMEW's Hospital with the scrotum livid and emphysematous from mortification. He died the same evening. "The scrotum and hernial sac were completely mortified, and within the latter was a small quantity of a most exceedingly offensive sanies, together with a large piece of sphacelated omentum only. The whole intestinal tube was within the belly perfectly sound, and in good order; but the omentum, within that cavity, had partaken considerably of the mischief done to that part of it which was in the hernial sac, and was gangrenous throughout."*

Mr. POTT has recorded another case, in which a gentleman with an omental hernia was thrown forward against the pommel of a saddle, and received a violent blow on the rupture. It was followed by inflammation. A surgeon, who saw it after a few days, punctured the swelling, and let out a pint of brown, serous, fetid fluid. Sloughing ensued, exposing the omentum, which was gangrenous. The mortified parts were detached, and the patient recovered after a long illness attended with much danger.†

CASE.—*Inflammation and suppuration of the omentum in an inguinal hernia, from injury; extension of the mischief to the omentum within the abdomen: recovery.*—The omentum contained in an inguinal hernia became inflamed in consequence of a kick from a horse. Suppuration ensued, attended with rigor, and serious constitutional disturbance. At last fluctuation was perceived, and the sac was opened: a mass of thickened and adherent omentum was exposed, and six ounces of well-formed pus escaped from the middle of it. Matter also flowed from the abdomen into the sac. The patient recovered.‡

The omentum in a hernial sac is liable to spontaneous inflammation, which may proceed to suppuration and mortification: but the occurrence is less common than that of inflammation from external causes.

CASE.—*Inflammation of an epiplocele, with suppuration and mortification: recovery; radical cure of the rupture.*—In a scrotal hernia which had been irreducible for twelve months, the patient was suddenly attacked, without any assignable cause, on the 6th of August, with acute pain and swelling in the inferior part of the hernial tumour, extending along the course of the spermatic cord to the

* *Ibid.* p. 243.

† *Works*; vol. ii. p. 70.

‡ *London Medical Gazette*; vol. iii. p. 332.

loins, and accompanied with rigors and vomiting: the scrotum was highly inflamed, tense, and tender. Venesection was employed, followed by aperients, which produced copious evacuations. Indications of suppuration were observed on the 9th, with great pain and constitutional derangement. A distinct fluctuation was perceived on the 12th, and two livid spots were seen on the front of the swelling, which was still hard and painful towards the ring. The scrotum did not ulcerate till the 20th, when a thin membranous bag protruded: this gave way on the 24th, and discharged a pint of sanious fluid containing shreds of omentum. The separation of this part went on till the 7th of October. The swelling entirely subsided, and the patient remained radically cured of the rupture.*

Dr. MACFARLANE has recorded a case in which chronic inflammation and suppuration occurred spontaneously in an epiplocele; first on the left, and then on the right side, in the same subject.

CASE.—A labourer, fifty-six years of age, had been subject for many years to a reducible hernia of the left side. For the last two years he had been unable to return a small portion, which gave him no uneasiness, and did not prevent him from wearing a truss. Seven weeks ago a large portion descended suddenly, and soon became painful, as he imagined, from being bruised. He continued at his employment for four weeks longer, when he was obliged to desist by the increase of pain and swelling. For ten days the pain was moderate, the bowels were with difficulty opened by purgatives, and he had repeated attacks of colic, with a painful sensation of dragging at the stomach. Leeches, purgatives, and fomentations were employed. When seen by Dr. MACFARLANE, he had been confined to bed for three weeks. He had a large, pyriform, painful tumour, extending from half an inch above the external inguinal ring, where it was nearly as thick as the wrist, to the bottom of the scrotum. The neck and posterior part of the tumour had an irregular doughy feel: in the former, an impetus could be felt on coughing, and it was painful on pressure. In front the tumour was tense and elastic; the integuments were much thickened, but not inflamed. The abdomen was free from swelling and tension, and affected

* SIR A. COOPER, part 1, p. 26, 7. Ed. 2.

with occasional flatulent pain : there was occasional nausea, but no vomiting. The progress of the symptoms was not arrested by the application of leeches, with the use of cold lotions, purgatives, and anodynes. The pain now extended from the tumour to the navel, and was aggravated by pressure, coughing, and deep inspiration. The tumour was larger, more tense, and presented distinct fluctuation. There was vomiting, hiccup, anxious countenance, dry tongue, and pulse at 116. The operation was performed. When the sac was penetrated, eight ounces of thick pus flowed out. The posterior surface of the sac was covered by a hard, irregular, and adherent mass of omentum. The adhesions intercepted the communication with the abdomen : when they were torn through, the finger passed easily through the ring into the cavity. The upper part of the wound was closed, and the lower left open. In about three weeks, the portion of omentum occupying the lower part of the sac, became considerably detached, and projected between the edges of the wound : it was removed by the knife. The wound healed, and the patient recovered.*

Between two and three years afterwards a tumour came in the right groin of this patient, and was easily reducible. He was admitted into the Glasgow Infirmary in consequence of the rupture having become irreducible, for the previous four weeks, and occasioned painful feelings in the abdomen, which had greatly increased for eight days. The symptoms increased ; stercoraceous vomiting came on ; and the operation was performed. Two ounces of pus escaped when the neck of the sac was laid open. The tumour contained omentum, which was livid and firm, but in some points pulpy. It was extensively adherent. When the adhesion had been partially removed, sero-purulent fluid escaped from the abdomen into the sac. The ring was perfectly free. Temporary relief followed the operation ; but the bad symptoms returned, and the case ended fatally in forty-eight hours. *Inspection.* There were slight traces of peritoneal inflammation, and twelve ounces of sero-purulent fluid in the cavity. The omentum formed a large, irregular, thickened, dark mass, almost wholly contained in the right hernial sac ; and the portion in the latter was partly gangrenous. The colon was dragged down and

* *Medico-chirurgical transactions* ; vol. xvi. p. 274—279. See also LE DRAN ; obs. lxiii ; and ARNAUD, *Mém. de chirurgie* ; p. 546.

firmly fixed nearly in contact with the internal orifice of the inguinal canal. No part of the omentum was attached to the left hernial sac.*

In a case of epiplocele complicated with hydrocele, which came under the observation of Dr. MACFARLANE, the injection of the latter with wine and water caused serious inflammation of the omentum. The narrative of the case is calculated to inculcate the necessity of proceeding very cautiously in our attempts to cure a hydrocele radically under such circumstances.

CASE.—*Omental hernia with hydrocele ; inflammation of the omentum from injection of the hydrocele ; symptoms of strangulation, and operation ; recovery.* This patient had been subject for nine years to a small irreducible rupture of the right side, with repeated attacks of pain in the swelling, colic and constipation ; subsequently uneasy feelings had occurred in the testicle : these had become more severe for the previous year, and the testicle enlarged. Dr. MACFARLANE evacuated the fluid of the tunica vaginalis by a simple puncture, and found the testicle twice its natural size, and exquisitely painful : he therefore recommended that the radical cure should not be attempted. When the water had reaccumulated, the patient went to another surgeon, who punctured the hydrocele, and injected wine and water. Acute pain was immediately excited in the testis and back, and became so severe that the injection could not be retained above two minutes. The pain continued for several hours ; but there was only slight swelling, and a faint blush of redness round the margin of the puncture. On the following day there was a smart rigor, succeeded by febrile excitement, dull pain in the rupture, and slight nausea : the pain extended to the abdomen, which became intolerant of pressure. The bowels were constipated. The next day, the hernia was exquisitely painful on pressure : there was incessant vomiting, with small wiry pulse and anxious countenance. As the usual antiphlogistic means had been resorted to without success, and the patient was in imminent danger, Dr. MACFARLANE performed the operation. The sac contained half an ounce of fluid. The omentum was dark red, dense, not susceptible of expansion, firmly adherent to the back of

* *Ibid.* p. 286.

the sac, and compressed by the tendon of the obliquus externus. The protruded portion was cut off; the ring enlarged, and the omentum thus fairly replaced in the cavity. The vomiting ceased after the operation; and full relief occurred, in a few hours, from a large bleeding and copious offensive stools consequent on the administration of an active aperient and an enema. The sac suppurated freely, and the patient soon recovered. He experienced no return of the colic and dragging pains at the stomach, which had formerly so much annoyed him.*

A large quantity of fluid has sometimes been found in the sac of an adherent and irreducible epiplocele: such cases are mentioned at pages 132 and 257, both of which were congenital ruptures. In the former Mr. POTT punctured the swelling and let out above a pint of brown serum. The puncture healed without any symptoms, and the fluid collected again. The puncture may, however, be attended with more serious effects, as in the following case. It should not therefore be resorted to unless for strong reasons; and it should be preceded and accompanied by all the precautions calculated to avert inflammation.

CASE.—*Omental hernia with fluid in the sac; puncture and suppuration of the sac.*—A patient, twenty-eight years of age, was admitted into GUY's hospital, with a large scrotal hernia, which had come down suddenly. The swelling and the abdomen were a little tender. The bowels were opened, but the parts could not be returned, although bleeding, leeches, warm-bath and cold applications were effectively tried, and he left the hospital. He returned in six weeks, the swelling being uneasy. It was firm at the neck and distended below with fluid, which could not be forced into the abdomen by pressure. Several ounces of fluid were drawn off by puncture with a trochar. The operation was followed by considerable inflammation of the sac, which subsided; and the fluid collected again: a second puncture at the end of ten days produced a greater degree of inflammation, which terminated in suppuration of the sac. The constitutional fever ran high, but was subdued by calomel and opium, with the effervescing draught and hyoscyamus. The suppuration gradually diminished, and he left the hospital quite well, with but little swelling of the

* Ibid. p. 255.

scrotum, caused by a small portion of adherent omentum.*

Treatment of irreducible epiplocele.—The mode of proceeding described in CHAPTER VII., on the *treatment of irreducible ruptures*, is particularly applicable to those which contain omentum; and instances of its efficacy in such cases are there mentioned. The plan consists of confinement to bed, purging, low diet, and the application of cold to the tumour, by means either of ice or of evaporating lotions. Pressure by means of a laced suspensory bandage may sometimes be employed with advantage. Mr. HEY says, “I have cured several troublesome cases of this kind, by confining my patient to bed, giving at the same time gentle laxatives, and enjoining a low diet. In one case, the confinement of a week was sufficient to effect my purpose; in general, however, it has required five or six weeks.”†

SIR A. COOPER directed the application of ice to an omental hernia, which had come down about a fortnight before, and could not be returned, though it was free from pain. The swelling was diminished in twenty-four hours, and had disappeared entirely in four days. In another similar instance, the object was accomplished in five days.‡

If ice should be employed, the effect of the application must be carefully watched, especially in patients of weak constitution, in order to prevent the integuments from being frozen, as they were in the following case.

CASE.—*Irreducible omental hernia treated by the application of ice; freezing and mortification of the skin.*—A labourer, fifty-seven years of age, of feeble constitution, had a scrotal epiplocele, which had been irreducible for nine years. He was subject, especially after meals, or when the abdomen was much distended, to dragging at the stomach, vomiting, and constipation. These symptoms were relieved by lying on the left side with the body bent forwards, and the thighs drawn up: sometimes they continued for hours, and did not subside until after free evacuations from the bowels. The swelling enlarged in consequence of exertion in lifting a heavy weight, and symptoms of strangulation came on. As these continued, in spite of active treatment,

* *London Medical Gazette*, vol. iv. p. 105.

† *Practical observations*; 3rd edit. p. 222.

‡ Part i, 2nd edit. p. 26.

the operation was proposed, but the patient would not consent: it was therefore determined to apply ice to the swelling. The local and general symptoms were soon relieved, and the treatment was therefore continued. The patient was not seen for twelve hours, during which the ice had been repeatedly renewed. The patient now felt quite well; the pain of the rupture and the abdomen had gone, and copious stools had been obtained by purgatives and clysters. The integuments covering the tumour were cold, hard, and ash-gray, whilst the adjacent skin was yellowish and ecchymosed. The parts thus altered in appearance sloughed, and in nine days the hernial sac, testicle, and cord were freely exposed. On the third day after this suppuration, the tumour, about the size of a large lemon, had all its external attachments destroyed, except a pedicle about the thickness of the finger, which connected it to the inguinal ring. This was divided, with little pain; a few drops of blood only escaped. Dr. MACFARLANE was now able to examine the state of the ring. He found the omentum closely adherent to the neck of the sac; but the adhesions were so softened by the previous suppuration, that they were easily destroyed with a probe, and the omentum was pushed with the finger into the abdomen. The patient recovered, and wore a truss to prevent relapse: he was relieved from the inconvenience and suffering, which the protrusion of the omentum had occasioned, and enjoyed much better health than he had previously.*

Strangulated omental hernia.—The sensible characters of the swelling are often insufficient to point out the distinction between an omental and an intestinal rupture, or between the former and one of the mixed kind. When a small portion of intestine is situated behind a mass of omentum, we may be unable to ascertain its presence by examination of the swelling. In a case, which we have already known as an epiplocele, the symptoms of strangulation may be produced by the recent addition of so small a piece of intestine, as not to add to the apparent size of the tumour.

A strangulated epiplocele is frequently presented to our notice with the tension and elasticity of an enterocele; these symptoms depending on effusion of fluid into the sac.

Hence we are frequently unable to determine, especially

* *Medico-chirurgical Transactions*; vol. xvi. p. 269.

when we see the case for the first time in the state of strangulation, whether the rupture is omental or intestinal, whether it is simple epiplocele, or a mixed protrusion.

An omental rupture may experience such pressure, at the moment of its formation, as to cause acute pain in the part, extending to the abdomen, vomiting, constipation, in short, the symptoms of acute strangulation. An example is seen in the case already related at p. 438.

Although the local symptoms of strangulated epiplocele are severe, such as pain in the swelling, particularly at its neck, and pain in the abdomen, which is not accompanied with tension or swelling, the constitutional disturbance is less serious, and hence the danger is less urgent. Nausea comes on, and vomiting; the latter perhaps less frequently than in strangulated enterocele. Sometimes the symptoms are aggravated in the extended position of the trunk, and mitigated when the body and thighs are bent forward.

Often there is no distinction, in the nature or severity of the symptoms, between omental and intestinal ruptures; so that the most experienced surgeons have sometimes concluded wrongly, from the violence of the disorder, particularly from the vomiting and constipation, that intestine must have descended, in cases which they had formerly known to be simply omental ruptures.

It might be expected that constipation would not be found so constant and striking a symptom of omental as of intestinal ruptures; and we find frequently that stools can be procured in the former case, especially in the earlier periods. But, when strangulation is fully established, this symptom is found in epiplocele as well as in ruptures containing intestine. I relate the following case, not only to exemplify that point, but also to show that the distinction between intestinal and omental ruptures, drawn from their sensible characters, cannot be depended on. The case is interesting from the circumstance of the patient having been pregnant.

CASE.—HANNAH HAMPSON, thirty-seven years of age, admitted into ST. BARTHOLOMEW'S Hospital with a strangulated femoral rupture, is married, and in the fifth month of pregnancy. She says that she has felt the motions of the child. She has had the rupture five years, and has never worn a truss. The parts have receded in the recumbent posture: she has always returned them with ease till five months ago, since which time reduction has never been com-

pletely effected. She had experienced no uneasiness from the swelling till the 5th of August, 1831, when it became painful as she was returning home from her work in the evening. She endeavoured to reduce it, but ineffectually: violent sickness came on, and lasted all night, with increased pain. In the morning of the 6th she was bled by a surgeon, who attempted to return the swelling. She came to the hospital on the 6th of August at noon. There is a tumour in the left groin about the size of a pigeon's egg, possessing the elasticity supposed to characterise an enterocele: an impulse is felt in it on coughing. The pain in the swelling is now trifling: this symptom and the sickness have been much relieved by the venesection, since which she has vomited only once. The bowels have not been opened since the morning of yesterday, twenty-nine hours; and she has taken no aperient medicine. The abdomen is not tense nor painful; and the pulse is not much disturbed. The circumstances of this case were not urgent; and it was doubtful whether the symptoms might not have yielded to local bleeding with purgatives. But, as no doubt was entertained of the tumour being intestinal, as strangulation had existed for eighteen hours and costiveness about thirty, I deemed it expedient to operate immediately rather than encounter the risks of delay. The operation was therefore performed in two hours after the patient's arrival, the warm-bath and the taxis having been tried without success. The sac contained some fluid, and a portion of omentum; the latter thickened, more vascular than in the natural state, and partially adherent to the neck of the sac. The omentum was cut off near the neck of the sac, and six vessels, which bled freely, were tied. The sides of the wound were then brought together by sutures, and it was covered with a wet cloth. (One dram of Epsom salt every three hours.) 9 P. M. She has not vomited since the operation; but feels slight nausea, bowels not open. (Six grains of calomel immediately.) August 7th. The bowels have been freely evacuated: the abdomen is free from pain; the nausea has disappeared. The sutures were cut out on the 8th; the ligatures on the omental vessels came away on the 14th, and she was discharged quite well on the 25th.

The indications of cure in strangulated epiplocele are, to lessen the local disorder, and the general disturbance excited by it, and to procure evacuations from the bowels.

If we could accomplish the latter object, the former would follow ; purgatives, however, will be more likely to succeed when the irritability of the stomach and the general disturbance have been lessened by depletion. Blood should be taken, according to circumstances, either by venesection or leeching ; cold should be applied to the swelling, more particularly by means of ice ; purgatives should be given, such as calomel with compound extract of colocynth, or the croton oil ; and purgative clysters should be administered. If these means should be unsuccessful, the tobacco clyster may be tried.

If we are certain that the case is simple epiplocele, we may persevere longer with the means now enumerated, than would be otherwise advisable : for the necessity of operation is less urgent than in intestinal ruptures. The same remark is applicable to those instances, of which several have been previously noticed, where inflammation of the omentum is brought on by external or internal causes, and not by strangulation. Free local depletion, and the application of cold to the swelling, are particularly suited to such cases. When, however, matter is formed, or the omentum has mortified, the sooner we operate the better. The evacuation of matter or sanies, and the exposure of gangrenous omentum, afford the greatest relief both locally and generally.

When the omentum, on opening the sac, is found free from disease, it should be replaced in the abdomen, the surgeon taking care not to use such force as might injure its delicate texture.

It is often found inflamed from the pressure of the stricture ; it is thicker and redder than it should be ; we sometimes feel its arteries pulsating strongly, and they bleed freely when divided. It is unsafe to return omentum thus diseased into the cavity of the abdomen : it may excite inflammation of the serous surfaces with which it comes into contact ; and it frequently becomes gangrenous, with the greatest danger to the patient's life.

CASE. — *Mortification of inflamed omentum after its replacement in the abdomen.*—In a young man, who underwent the operation for bubonocoele at ST. BARTHOLOMEW'S Hospital, a large piece of omentum, highly inflamed, preternaturally red, and with its arteries pulsating strongly, was returned into the belly with the intestine. Violent peritonitis came on in twenty-four hours, requiring active

depletion, in spite of which the patient was brought into extreme danger. The source of the mischief was rendered evident by great tenderness in the situation occupied by the returned omentum, as well as by swelling and hardness in the same region. The edges of the wound fortunately gave way and allowed the escape of matter, which continued to flow in abundance, with the addition in a few days of mortified omentum in portions of various size. The quantity which thus came away was considered equal to the entire omentum. The patient recovered.

Sir A. COOPER has recorded an instance nearly similar, in which the patient was in the greatest danger, and the mortified omentum was discharged at the wound.*

Mr. CLEMENT† operated on a strangulated inguinal entero-epiplocele in a female, aged forty-nine, about twenty-four hours after the commencement of the symptoms. The contained intestine is said to have been exceedingly hard; but the condition of the omentum is not particularised: both were returned. The case went on favourably enough till the seventh day, when in straining to evacuate the bowels, the wound opened, and omentum protruded to the size of a billiard ball: it became strangulated and sloughed. The mortified part separated in about ten days, and the patient recovered.

The omentum is sometimes dark red or livid; and it has a crisp or brittle feel. There is an appearance, on cutting it, as if blood were extravasated in its substance; but an incision into the part, under these circumstances, is not attending with bleeding. A portion of omentum, when thus altered, may be expanded as in its natural state. This condition, which leads to the loss of vitality, is sometimes mentioned under the name of gangrene: when it is thus altered, or still more deeply discoloured, its replacement is more dangerous and objectionable than in the state of simple inflammation.

Mr. HEY operated on a congenital entero-epiplocele in a youth of seventeen, and found both omentum and intestine "of a dark colour, but not in a state of mortification; except a small part of the omentum, of which there was some doubt." "Some difference of opinion, or considerable doubt at least, arose respecting the reduction of the omen-

* Part i.; 2nd Ed. p. 41.

† *Observations in Surgery and Pathology, illustrated by cases*; p. 47.

tum. It was at length reduced without any retrenchment after the opinion of the majority of the surgeons present." Symptoms of inflammation followed the operation, and were relieved by bleeding and purging. The patient died in a week, the wound having looked well throughout. That part of the omentum which had been prolapsed was now completely mortified; and lay just above the ring, which was healed internally, so that no aperture remained in the peritoneum." The portion of intestine, which had been strangulated, is said to have been *gangrenous*; it was probably dark-coloured, but not deprived of life.*

In another case, where death followed the operation within forty-eight hours, the returned omentum was found brittle, and dark-coloured at its inferior part. Bloody serum was contained within the abdomen. These changes would have been a source of great danger to the patient, independently of the peritoneal inflammation, which was considerable.†

The foregoing facts show how dangerous it is to return omentum, when actively diseased, that is, inflamed, or in a state of change tending to mortification. It would be equally improper to replace it, when enlarged, thickened, or converted into a mass of fat. It would often require so large an incision of the ring as to weaken the parts considerably, and thereby increase the chance of a future protrusion. The presence of such a diseased mass in the abdomen would probably excite inflammation in the surrounding parts, and thereby bring the patient into a state of danger, not less than that from which the operation had relieved him.

If the protruded portion be large, and if it has been long out of the abdomen, the propriety of returning it is questionable, even although it should not be much altered in structure.

The danger arising from the replacement of diseased omentum is further exemplified in an instance related in the tenth volume of the *Medical and Physical Journal*.‡ A portion of this organ, described as having been of "a livid black colour," was returned into the abdomen. Violent inflammatory symptoms, attended with constant vomiting and restlessness, appeared soon after the operation; and

* *Practical observations*; 3rd Edit. p. 220

† *Ibid*, p. 174.

‡ ROBERTSON, *Case of hernia congenita*, p. 33.

everything indicated the most unfavourable termination. An abscess formed, from which four pounds of matter, together with a sphacelated portion of omentum, eight inches long and two broad, were let out; and the patient recovered.

Various proceedings have been employed in the management of such diseased pieces of omentum as surgeons have thought it unadvisable to return. They have placed a ligature on the root of the altered part, removed the substance below this, and then returned the remainder into the cavity of the belly, retaining the ends of the ligature on the outside. It happens too frequently in the practice of surgery, that an unfounded fear of hemorrhage causes the ligature to be used under circumstances, where the knife alone would answer every reasonable purpose. It must have been some apprehension of this kind, that induced operators to tie the omentum previously to retrenching the diseased portion. The consequence of this practice is an inflammation of the part extending within the abdomen to the stomach and transverse arch of the colon. This is the circumstance, which, represented in several cases by the best surgical writers, militates so strongly against including the omentum in a ligature; and a case, which I shall presently produce, tends to reprobate it, if possible, still more. What can indeed be more contrary to reason, than the practice, which we are now considering? The symptoms, which oblige us to operate, arise from the pressure of the ring upon the omentum: no sooner have we freed the part from this stricture, than we subject it to a more close one: for the ligature does what the ring did before; and does it more effectually. If strangulation of the omentum by the ring is sufficient to produce dangerous and mortal consequences, must they not be equally expected from that stricture which is caused by the ligature?

CASE I.—A woman, not less than sixty years of age, was sent into ST. BARTHOLOMEW'S hospital, May 28, 1800, by Mr. BLAIR, with symptoms of a strangulated umbilical hernia. According to her own history, she had been pregnant about twenty-three years previous to her present indisposition; when, as she was suffering much from labour-pains, a tumour made its appearance at her navel. At first it was about the size of an orange, but, never being sustained by bandage, it increased slowly till it acquired a very considerable magnitude. It had continued for that

long space of time without any particular inconvenience to her, if we except those occasional attacks of colic, diarrhoea, and vomiting, to which most persons, especially those advanced in life, afflicted with this kind of hernia, are so peculiarly liable. Eleven days, however, before her admission into the hospital, the tumour, already very large, grew still larger, became extremely painful and tense, and tenderness extended over the whole surface of the belly. All this time she had had no evacuation by stool; there was continual nausea and vomiting; the pulse was frequent and small, with thirst, and other febrile symptoms.

Surgeons are well aware that the existence of an epiplocele, as it will afterwards appear that this originally had been, renders persons so afflicted constantly subject to protrusion of the intestines. This was the unfortunate circumstance that had happened in the present instance; for, though the patient had lived without great inconvenience for twenty-three years, with a large omental protrusion, a small piece of intestine at last slipped down, converted the disease into an entero-epiplocele, and, being incarcerated, gave rise to all the urgent symptoms of the last eleven days.

It must be acknowledged, that in many cases of exomphalos it is a matter of great difficulty to ascertain whether the bad symptoms arise from strangulation, or from other affections of the abdominal viscera, with which persons having such herniæ are much troubled; but in the one under consideration the difficulty was less: for the sudden increase and inflamed state of the tumour, the long duration of the symptoms, and particularly of the constipation, sufficiently indicated the nature of the case. The operation was performed in the evening, and the division of the integuments and hernial sac brought into view a large mass of thickened and indurated omentum, which adhered so firmly to the whole internal surface of the sac, that much dissection was necessary to separate them. Beneath the omentum a strangulated portion of the jejunum was discovered, about five inches in length. The intestine was returned into the abdomen without any division of the parts through which it had come out, and the large mass of diseased omentum, composing the bulk of the hernia, remained at the disposal of the surgeon. The operator placed a ligature round the root of this part. The sympathy between the omentum and the stomach was conspicuous to

every observant spectator : at the moment that the ligature was drawn the patient's agony was heightened, her vomiting instantly recurred. But the momentary increase of pain and sickness is a matter of trifling importance, when we contemplate in a comparative view other more permanently injurious and frequently mortal effects of this practice. It is the succeeding inflammation that ought principally to excite alarm. The operator next proceeded to amputate what remained of the omentum below the ligature, which might be about three quarters of the protrusion, and the rest was left in the hernial sac unreduced. The patient, soon after the operation, had stools, but the pain at her stomach was excruciating, the vomiting soon returned and became incessant : her nights were restless, and finally, after lingering eight or nine days, she died. A little before death a portion of the integuments, which formerly contributed to envelop the hernia, sloughed. On examination of the body the usual and fatal effects of the ligature were seen. Within the abdomen the omentum was in a gangrenous state, and inflammation had extended to the colon ; all the rest of the abdominal viscera had a healthy appearance.

CASE II.—I saw another instance, in which a large mass of omentum, contained in a strangulated scrotal rupture, was included in a ligature. The patient died so soon after the operation, from inflammation of the bowels, that the effects of the ligature could not be sufficiently displayed : yet the state of parts ascertained by dissection rendered it probable, that the consequences of this practice would have been injurious had the patient survived. The omentum was collected by the ligature into a thick mass, tightly stretched over the intestines, and manifestly dragging on the stomach. If it had become fixed by adhesion in this state, may we not reasonably conclude, that the irritation of this unnatural connexion would have produced distressing effects on the stomach ? The part round which the ligature was placed had ascended about three inches within the abdominal ring. Hence the portion of this viscus below the ligature would have sloughed within the abdomen, and the patient must have encountered no trivial risk from this source.

CASE III.—An observation published by POUTEAU, shows us the danger that may be expected from including the omentum in a ligature ; and as it supports the truth of the opinions now delivered, it may be proper briefly to

annex the particulars. The operation for bubonocoele had been performed on a young man twenty-five years of age ; it was not difficult, after releasing the intestine from stricture, to return it in an apparently sound condition. A portion of omentum, which had accompanied it, was too large to be replaced without extensive excision : wherefore POUTEAU determined to extirpate it after applying a ligature. Soon after the operation, the vomiting caused by the strangulation ceased, and the patient had stools ; but in a short time he complained of acute pain at the stomach ; the whole surface of the abdomen became extremely tender, and he expired in thirty-six hours, although all the medical assistance had been afforded him that his situation demanded. On opening the body, the omentum was found sloughy through its whole extent, and had contracted adhesions to the peritoneum.*

In the third volume of Mr. POTT's works we find a relation of three † cases, where the omentum, having been tied, inflamed and became gangrenous : they all terminated in death. The mind of this celebrated surgeon was so deeply impressed with the fatality of the practice, that he declares his intention never to employ the ligature again.‡ Two other examples of the fatal effects of the ligature may be found in the *Mémoires de l'Académie de Chirurgie*.§

It was made a question in the Academy,|| whether, be-

* SABATIER *de la Médecine Opératoire*, tom. i. p. 23.

† Page 259—266.

‡ “ As I am by repeated experience convinced, that a portion of the omentum, however large, may be extirpated with perfect safety, without being previously tied, I shall never practise nor advise the ligature.” POTT's *Works*, vol. iii. p. 259. On another occasion he bears still stronger testimony to the same point. “ I will not pretend to say that there never was a dangerous or fatal flux of blood from the division of the omentum without ligature ; but I can truly say that I never saw one ; that I have several times cut off portions of it without tying, and never had trouble from it of any kind, though I have always made the excision in the sound part ; and that, from the success which has attended it, I shall always continue to do so, whenever it shall become necessary. Upon the whole, I cannot help thinking the ligature both unnecessary and pernicious, and can venture from experience to say that any portion of the caul, which it may be thought necessary to remove, may very safely be cut off, without any previous tying.”—Vol. ii. p. 133.

§ Tom. iii. pages 73 and 399, 4to. edition.

|| See two memoirs on this subject, in the third volume, by M. VERDIER and M. PIPELET. That of the former is entitled, “ *Sur une plaie dans la capacité du bas ventre ; avec des remarques sur la ligature de l'Epiploon*,” p. 367 ; the latter is, “ *Sur la ligature de l'Epiploon*,” p. 394 ; BOUDOU, chief surgeon of the Hotel Dieu, had so often experienced the bad effects of the ligature, that he was induced to give it up, tom. iv. p. 316. M. CAQUE', surgeon to

fore returning the omentum into the abdomen, there was any necessity for tying its cut edge. Many observations on the human subject, and several experiments on dogs, showed that no danger arose from its being replaced without a ligature, and that the practice of tying it often produced injurious consequences. This our countryman SHARP had already determined by his own experience; he had constantly practised the excision of the omentum without a ligature, having found the apprehension of bleeding perfectly groundless.* We must then conclude, that if SHARP and POTT, two of our ablest and most experienced surgeons, never experienced any trouble from hemorrhage when no ligature was used; if the most enlightened foreign practitioners have met with the same success; and if pernicious and fatal consequences have repeatedly occurred from a different practice, the plan of tying the omentum in a mass before cutting off a diseased portion of it, ought to be entirely abandoned.†

the hospital at Rheims, had extirpated the protruded portion of omentum and returned the remainder without any ligature, in nine cases, with success. *Ibid.* tom. iii. p. 407.

In speaking of protrusions of the omentum caused by penetrating wounds, LARREY says, “la ligature totale faite sur la portion saine de l’Epiploon est généralement suivie d’une irritation profonde, violente, accompagnée d’inflammation, d’abcès, souvent de la gangrène, et de la mort. J’en ai vu un grand nombre d’exemples.”—*Mémoires de Chirurgie Militaire*, tom. iv. p. 277.

* *Critical Inquiry*, p. 35.

† The facts and arguments adduced in the text on the subject of tying the omentum fully justify an unfavourable view of that practice, in which the opinions of the most able surgeons concur. I subjoin the contrary statements of ARNAUD, whose experience on this particular subject has perhaps never been equalled by that of any other individual. He gives the following general result of his practice. “De plus de huit cents opérations de hernies, que j’ai faites en ma vie, je crois en avoir trouvé plus d’un tiers avec des epiploceles; et je puis protester qu’il ne m’est jamais mort un seul malade par la faute de la ligature.” *Mem. de Chirurgie*; tom. ii. p. 6, 627. Nothing can appear more favourable than this assertion; yet we find, that the ligature caused sometimes, in the practice of ARNAUD, those unpleasant effects which occurred to other surgeons. After employing two ligatures, he removed one pound and three ounces of omentum. The operation was followed by an extremely painful and distressing sensation in the epigastric region, nausea, hiccup, and vomiting. Copious bleedings and narcotic remedies were equally ineffectual in subduing these symptoms, which ceased immediately on removing the ligature. It should seem from the following quotation that these effects often ensued, and were relieved in the same way.

“J’ai toujours employé cette methode, et elle m’a toujours réussi, excepté dans des occasions, ou j’ai été obligé de couper la ligature aussitôt que je me suis aperçu que l’orage se preparoit, sans m’occuper en vain de saigner ni de medicamenter mes malades. Dès qu’elle est coupée les accidens cessent.” When we consider that the omentum is drawn up into the abdominal cavity, after its replacement, we have some difficulty in understanding how the ligature could be so readily removed.

In proceeding to remove a portion of omentum, we should first unfold it, in order to ascertain that no intestine is included, then cut away the morbid part with the scissars or knife, and tie the bleeding vessels. The foregoing objections are only applicable to the practice of tying the omentum in a mass: they do not apply to the proper and indeed necessary precaution of securing individually, by small silk ligatures, any vessels which afford hemorrhage. When this has been done, and one end of each ligature has been cut off at the knot, the part may be returned into the cavity, the other ends of the ligatures being left in the wound. I have sometimes tied the bleeding omental vessels with fine silk ligatures, and cut off both ends close to the knot: but I think the usual mode of proceeding, that of leaving one end in the wound, is safer.

The arteries of the omentum are capable of bleeding freely, especially under the excitement of inflammation; we must therefore examine the cut edge carefully, and satisfy ourselves that hemorrhage has ceased before we replace the part, remembering that the cavity of the abdomen is a situation favourable to the continuance or renewal of bleeding under such circumstances. The omentum may slip back into the belly, after a portion has been cut off, if we do not retain it on the outside: should this happen, when the vessels have not been secured, fatal internal bleeding may be apprehended.

CASE.—A patient, twenty-seven years of age, had a scrotal hernia, which was operated on twenty-four hours after the occurrence of strangulation. The bowel was returned, and a piece of omentum was then removed. Considerable bleeding followed the division of this part, but it ceased in a few minutes, the omentum having then slipped into the abdomen. The patient died about thirty-three hours after the operation. A quart of fluid blood was found in the cavity after death.*

Mr. HEY informs us that he had twice, and only twice, cut off a considerable portion of omentum in the operation for strangulated hernia, and returned the remainder without securing any blood-vessels. The reduction was in both cases followed by hemorrhage, which nearly proved fatal to one of the patients. In the first case, arterial hemorrhage began soon after reduction; the divided portion of omentum having receded so completely, that there

* LANCET, vol. xii. p. 638.

was no chance of securing the bleeding vessels. The quantity lost does not seem to have been considerable; and the bleeding ceased under the application of cold to the abdomen. In the other instance, after a gangrenous portion had been removed, the remainder retired spontaneously into the abdomen. Bleeding immediately ensued, consisting obviously both of arterial and venous blood; this however soon diminished so much that the wound was united by sutures. In two hours after the operation, which was performed at four in the afternoon, the patient was asleep. Mr. HEY was sent for at ten in the evening, on account of a bleeding, which had run through the bed to the floor. When the sutures had been cut out, blood still issued, apparently venous; it flowed irregularly, sometimes ceasing for ten or twelve minutes. The hemorrhage stopped about half-past one in the morning, and the patient, who continued for a fortnight in a precarious condition, ultimately recovered.*

I have found it necessary, almost invariably, to tie bleeding vessels after removing a portion of omentum; and it has frequently happened that several have required ligature. I cannot therefore agree with POTT and SHARP in their statements on this subject, (see *ante*, p. 457 and 458,) except in reference to the practice of tying the omentum in a mass before cutting off a diseased portion. The cases just adduced show clearly that patients would incur the most serious risk if the omentum were returned under such circumstances without the bleeding vessels having been secured.

Leaving the omentum in the wound.—CHOPART and DESAULT state, that when the omentum is irreducible merely from its bulk, they leave it in the wound, and it gradually retires into the abdomen.†

Mr. HEY followed the same practice in particular cases. He says when the prolapsed portion of omentum “is in a sound state, of little bulk, and strongly adherent to the hernial sac; and when, from inquiries made of the patient, we learn that this small part has been prolapsed for many years, without disturbing the functions of the abdominal viscera, we may fairly conclude that we shall not injure those functions by leaving such a portion in its prolapsed state. In such a case I have suffered the omentum to re-

* *Practical Observations*, pp. 188—199.

† *Traité des maladies chirurgicales*, tom. ii. p. 269.

main, and have found no difficulty in healing the wound, nor any injury afterwards from the application of a well-adapted truss. In one patient I left a portion, which I judged to be about two ounces avoirdupois in weight, which was the largest portion I have suffered to remain. The wound was healed at the expiration of six weeks after the operation. The pad of the truss, which was afterwards applied, consisted of an oval ring, made exactly to the shape of the remaining tumour. This kind of truss sat easy on the patient; and I suppose answered very well, as I have heard nothing from him to the contrary, though it was applied in the year 1772.”*

In one instance, Mr. HEY left a large piece of omentum in the wound, and removed it by means of ligature subsequently. It was in the case of a stout man, thirty-four years of age, affected with a scrotal hernia, which became strangulated on the 5th of May. After the employment of the most efficacious means, the operation was performed on the 8th. The sac contained a large mass of omentum, including a portion of intestine so completely hidden, that the latter could not be seen until the omentum was expanded. “The omentum was very livid, or rather black, on its exterior surface; some fragments of it within appeared sound, the sound and unsound parts being intermixed, so that there was no line of separation between them. It did not feel brittle. One part of it was compact and smooth, like the mesentery. A filament went off from this part, and adhered to the peritoneum just within the ring. The intestine was inflamed, and had contracted an adhesion to the omentum, about two inches in length and one in breadth. That part of the omentum, which adhered to the intestine, was quite black, but was easily separated from it by gentle pulling.” The intestine was reduced with ease. The omentum was obviously unfit for reduction. Mr. HEY considered that to have tied it in a mass would probably have been fatal to the patient, and he was apprehensive of danger from making such a wound as the excision of the diseased portion, estimated at six or eight ounces, would have required. He therefore left it in the wound, covering it with lint spread with digestive. The case went on favourably after the operation. On the 11th, one-third of the omentum was separated in a gangrenous state, and the remainder began to granulate. On the 15th, a ligature of waxed

* *Practical Observations*, p. 172.

silk was applied round the basis of the mass, and drawn till the part appeared a little blue, and began to feel benumbed. It was tightened gradually till the 17th day, when the remaining portion was cut through; it was necessary to secure an artery in the centre with needle and ligature. The portion of omentum cut off weighed five ounces and five drams. The wound soon cicatrised.*

I have never followed this plan of leaving the entire mass of protruded omentum in the wound; nor does it seem to me advisable. It is attended with no particular advantage; but it exposes the patient to the possibility of serious evils. The omentum thus left in the wound must be liable to injury, inflammation, or other morbid change. That its displacement and connexion to other parts by preternatural adhesions may greatly disturb the functions of the stomach and colon, has been shown in several of the examples related in this chapter. A case recorded by Mr. HEY affords further evidence to the same point. He operated for femoral hernia on the sixth day of strangulation. The swelling contained intestine and omentum, both of which adhered to the peritoneum so strongly, that they could not be returned. The intestine burst about twenty-four hours after the operation, and the patient died on the ninth day. The intestine which had been prolapsed was in a diseased state, and the canal generally was inflamed. "The omentum was collected together like a rope, and passed down from the stomach and colon along the root of the mesentery, the small intestines lying before it. This situation of the omentum had drawn the lower orifice of the stomach almost into a vertical position. The transverse arch of the colon was so much compressed by the omentum running across it, that the solid feces were obstructed in their passage. The omentum was retained firmly in this situation by the adhesions which it had formed with the peritoneum near the femoral ring." †

To avoid all possibility of the afflicting consequences which might arise from such causes, we should make it a rule to separate all preternatural connexions of the omentum, and after removing any diseased portion, to replace carefully the sound part, that it may regain its natural situation in the abdominal cavity.

Since then the practice of removing diseased omentum, of securing the bleeding vessels, and of returning the re-

* *Ibid.* p. 181.

† *Ibid.* p. 210.

mainder into the abdomen, has never produced any injury to the patient, and is not likely to be followed by any ill consequence, it must, in the present state of our knowledge, be considered as the most advisable treatment.

The foregoing remarks apply to the plan of leaving the omentum in the wound, when it is not fit to be returned, as a general practice and matter of preference; we might adopt this course, as an exception to the general rule, under particular circumstances. Sir ASTLEY COOPER says, “with respect to the omentum, if the sac contains a very large quantity of it, or if, in consequence of long-continued protrusion, it adheres extensively, and has become very hard, it should be removed by the knife, taking care to secure the small vessels by ligature, if they bleed, and the portion of divided omentum is to be left to form a plug to fill up the orifice of the hernial sac. In one of the subjoined cases the omentum was left to slough, by which a troublesome sore was produced, and a considerable discharge was kept up for a great length of time. In the case of Mrs. PONDER, it will be seen that in consequence of its general adhesion, I left the omentum within the sac, and brought the integument closely together over it, which united without difficulty.” The case here referred to was that of a patient, seventy years old, in whom the exomphalos, as large as a swan’s egg, contained a mass of omentum, and a small portion of intestine. Sir ASTLEY COOPER says, that when the latter had been returned, “as the omentum adhered very generally to the inside of the sac, and its vessels appeared unusually large, and the subject, from age, extremely feeble, I did not choose either to return or remove it; but I brought the edges of the skin very closely together by sutures, and left it in the hernial sac, covering the wound with adhesive plaster.” The wound united rapidly, and the patient recovered within a very short time.”*

Appendices Epiploicæ. — As the structure of these bodies is analogous to that of the omentum, we might infer that the pathological conditions and the practical rules would be the same in both cases. These bodies, however, being connected to the intestine, from which they derive their vascular supply, are not subject to immediate strangulation, and consequently do not exhibit the same morbid changes as the omentum. Experience confirms what we

* PART II, edit. ii. pp. 44, 45.

might have expected before-hand ; namely, that so long as the intestine is free from inflammation, and the changes consequent on that process, the appendices do not suffer ; consequently, that they may be returned whenever the bowel is in a fit state to be replaced in the abdomen. I have never found it necessary to meddle with them ; but I should not hesitate to remove them if they should be so enlarged as to impede the return of the bowel. Sir A. COOPER operated on an exomphalos in a fat female of sixty-four. The rupture contained colon ; its appendices epiploicæ are said to have been of a dark venous colour. These bodies were thought to be too much altered to recover their natural state ; accordingly, several of them were cut away, and the intestine was then returned. The recovery was slow and tedious.*

* *Part ii. edit. ii. p. 42.*

CHAPTER XIV.

*Anatomical Description of the Femoral Rupture.*SECTION I.—DESCRIPTION OF THE PARTS, IN WHICH THE
FEMORAL RUPTURE IS SITUATED.

THE circumference of the os innominatum presents, at the upper and anterior part of the bone, a large excavation, bounded on the outside by the anterior superior spinous process of the ilium, on the inside by the spine of the pubes, and filled by certain muscles and blood-vessels, which pass from the abdomen to the thigh. Between the two bony points, constituting the boundaries of this hollow, the inferior edge of the aponeurosis of the obliquus externus abdominis is extended, under the name of the CRURAL ARCH, or **POUPART'S** ligament.

This concavity has an oblique position: it slants from behind, forwards, downwards, and inwards; so that one of its boundaries is external, superior, and posterior, the other internal, inferior, and anterior.* The distance between these is about four inches and a half.

The thick and rough margin bounding the circumference of the ilium at its upper part, and called the crista, terminates in front by a pointed protuberance, separated by a semilunar notch from a similar tubercle which is under it: these processes are named the *anterior spines* of the ilium:

* In the language of Dr. BARCLAY, the former would be lateral, atlantal, and dorsal · the latter mesial, sacral, and sternal.

and are distinguished by the epithets *superior* and *inferior*. On the inside of the latter, and over the acetabulum, there is a second notch, terminated by a smooth and gentle rising of the bone,* beyond which there is another excavation ending at the spine of the pubes.† Beyond the latter projection the edge of the bone is thick and level, extending inwards (mesially) for about an inch, and terminated by the symphysis. The point, at which this level horizontal part is continuous with the perpendicular line of the symphysis, is the *angle* of the pubes.

To the superior spine are attached the fascia of the thigh, the tensor vaginæ, the sartorius, the crural arch, and the iliacus internus; and to the inferior, one of the tendons of the rectus cruris. The two notches are filled by the iliacus internus and psoas magnus, and are continuous behind with the concave or pelvic surface of the ilium. The excavation situated towards the pubes is of particular importance. Its surface is smooth, broadest at the acetabulum, and growing narrower towards the spine of the bone; bounded in front by a prominent line, rising over the notch which contains the obturator vessels, and giving attachment to the pectineus; and terminated behind by a sharp and rough ridge, extended backwards and outwards from the spine, and called the crista of the pubes.‡ On this excavation the crural vessels are placed. The crista is continuous behind with the obtuse line,§ which bounds the concavity of the ilium, and contributes with it to form the superior aperture of the pelvis.

The space under the crural arch contains, besides the parts already enumerated, the anterior crural nerve, and some smaller nerves, which lie on the surface of the psoas and iliac muscles; the lymphatic trunks of the lower

* The cartilage, which joins in the young subject the two portions of the os innominatum, called the ilium and pubes, is placed in the middle of this rising; consequently, that part of the general excavation, which is situated laterally with respect to this point, belongs to the ilium, and that which lies mesially, to the pubes.

† GIMBERNAT, WINSLOW, and BICHAT call it by this name; SOEMMERRING gives it the appellation of *tuberculum spinosum*; *de corporis humani*. f. 40. tom. i. § 420. It is the *tuberosity of the pubes* of Sir A. COOPER.

‡ This, together with the following line, forms the *linea ileopectinea* of Sir A. COOPER. The surface of the bone at this part, as well as in the smooth hollow which receives the femoral vessels, is covered by a thick and closely adhering ligamentous substance called by Sir A. COOPER *ligament of the pubes*.

§ Sometimes called *linea innominata*: the tendon of the psoas parvus is inserted into it.

extremity and abdominal parietes, and one or more absorbent glands, surrounded by a loose cellular tissue.

The surface of the bone between the spine and angle forms the basis of the triangle described by the inferior aperture of the abdominal canal ; it is covered by the spermatic cord in the male, and by the round ligament of the uterus in the female subject.

The attachment of the aponeurosis of the external oblique muscle to the os innominatum has been described already, in the account of inguinal hernia :* it only remains for me to state more minutely some particulars concerning this part. It is fixed by a broad insertion into the pubes ; this attachment, which begins at the spine, runs along the crista of the bone. Its position, therefore, in the erect state of the body, is nearly though not entirely horizontal ; consequently its two margins should be described by the epithets anterior and posterior : it being remembered at the same time, that the former of these is rather higher than the latter. That part of it which is fixed to the spine of the bone has the appearance of a firm and somewhat round tendinous cord ; its insertion into the crista of the pubes is effected by means of a thinner portion, which gives to the crural arch a clearly defined sharp edge at its posterior margin. The latter division of the tendon must of course be situated more deeply from the surface than the former. Its sharp wiry edge can be felt distinctly by passing the finger under the crural arch, on the inner (mesial) side of the femoral vein, either from above or below.

If we describe a distinct part under the name of *POUPART'S* ligament, we should state, that when it approaches to the bone, it becomes suddenly broader ; that it is fixed by this broad portion along the whole length of the spine and crista of the pubes ; that it has a rounded and strong anterior edge, a thin and sharp posterior margin, and that the former of these is nearer to the surface, while the latter is comparatively deep-seated. The breadth of this part varies in different subjects : it is generally from three quarters of an inch to an inch. Sometimes, as *GIMBERNAT* † has stated, it measures more than an inch. *Dr. MONRO* ‡ has observed that it is broader in the male than

* See *ante* ; CHAPTER IX., SECTION 1.

† *Account of a new method of operating in Femoral Hernia*, p. 34.

‡ *Observations on Crural Hernia*, p. 51.

in the female subject ; and from this structure he explains partly the more rare occurrence of the femoral rupture in the male.

The anterior edge of POUPART'S ligament represents a slightly curved line, with the convexity downwards, extended from the ilium to the pubes : the posterior border has an arched form* towards the latter bone, in consequence of the expanded portion, which is fixed to its crista. Hence has arisen the appellation, used by GIMBERNAT, of the *crural arch*.

The parts, which have been already enumerated, fill up the space between the crural arch and the os innominatum. The crural vessels, placed in the smooth slope on the front of the pubes, are situated laterally with respect to each other. Next to the thin edge of the arch is the vein, with the artery lying externally to it. An absorbent gland is sometimes found between the vein and the tendon ; or else this space is occupied by loose cellular substance.

Since the tendon of the obliquus externus is stretched between two distinct points, and there is a wide space under it, the student might suppose, on the first view, that the abdominal viscera would be easily and frequently protruded under its edge. This, however, is prevented by the attachments of certain fasciæ, which confine the tendon closely to the surface of the subjacent parts.

The iliacus internus, and that portion of the psoas magnus which lies by its side, are covered by a thin fascia† intimately connected with the expanded tendon of the psoas parvus, when that muscle exists. This fascia is in immediate contact with the muscles ; the iliac vessels and the peritoneum cover its anterior surface, and are connected

* This is sometimes called the crescentic or crescent-shaped edge of the crural arch : and the portion of tendon which forms it has been occasionally mentioned under the name of GIMBERNAT'S ligament. (Mr. HEY'S *Practical Observations*, 3d ed. p. 146.) We are indebted to the Spanish surgeon for the first accurate description of the part in question ; but as it is only a portion of the crural arch, not distinct from the rest, any name which might lead the student to regard it as a separate ligament is objectionable. GIMBERNAT published his remarks in 4to. at Madrid, in 1793, under the title of *Nuevo método de operar en la hernia crural, dedicado al rey nuestro señor Don Carlos IV.* The English version quoted above was executed by Dr. BEDDOES.

† It is described by Sir A. COOPER, under the name of *fascia iliaca*.

Mr. J. CLOQUET calls it *aponevrose pelvienne*, and describes it as descending into the pelvis, lining the cavity, perforated by the vessels or nerves which pass out, and adhering to the sides of the viscera at the inferior aperture. *Recherches Anat.* p. 62.

to it by a loose cellular substance. It is attached on the inside to the line which bounds the superior aperture of the pelvis; on the outside, to the anterior portion of the inner edge of the crista ilii; and below, to the posterior margin of the crural arch.* The latter insertion terminates in a pointed form just over the passage of the vein. Another part of the fascia is continued over the bone, and behind the artery and vein, into the thigh, where it forms the posterior portion of the sheath, including those vessels, and is continuous with the fascia lata. In the interior of the sheath it produces a septum, dividing the vein and artery. In consequence of the structure just described, the crural arch is firmly confined in its situation, and the protrusion of the abdominal viscera under it is obviated.†

The crural or femoral ring and canal.—The space left under the crural arch towards its anterior or inner portion, for the passage of the femoral vessels, is called by GIMBERNAT ‡ the *crural*, by Mr. HEY § the *femoral ring*, and by others the *upper or posterior opening of the crural or femoral canal*. || In shape it is somewhat elongated transversely, measuring about an inch in its long diameter in the female, less in the male. It is bounded, above and in front, by the crural arch, the spermatic cord and the round ligament of the uterus lying on the arch close to this boundary; below and behind, by the horizontal portion of the pubes; on the inner or mesial side, by the thin border

* Here the fascia consists of two layers, with the arteria and vena circumflexa ilii passing between them.

† In the second edition of his work on hernia, SCARPA has described and delineated a further provision, calculated to secure these objects. After observing that the sheath of the femoral vessels is formed, within the pelvis, by the iliac fascia, and without by the fascia lata, both connected to the crural arch, he adds, that “this connexion between the internal and external aponeurosis is strengthened by a mode of union not hitherto indicated by anatomists; that is, by an attachment of the femoral sheath, formed by these aponeuroses, to the ilio-pectineal eminence of the os innominatum. This attachment divides into two parts the space left under the crural arch, braces the arch strongly down at its middle, and prevents any displacement of the vessels, in the various motions of the lower limb.” *Supplément au Traité Pratique*, p. 38, pl. 13.

‡ P. 38.

§ P. 148, 1st, edit. In the third edition this appellation is not retained in the text; see p. 147: though it is used in the explanation of pl. 7.

|| *Ouverture supérieure du canal crural*; J. CLOQUET. *Orifice postérieur du conduit femoral, or anneau crural postérieur*; BRESCHET.

Hintere Schenkelring; *annulus cruralis posterior*; A. K. HESSELBACH.

of the arch; and, on the outer or lateral aspect, by the united mass of the *psoas magnus* and *iliacus internus*, which are there closely covered by the *fascia iliaca*. The external half of this space is occupied by the crural vessels, resting on the pubes, the artery on the outer, the vein on the inner side. The inner portion is filled up by cellular and adipous substance, in which a lymphatic gland of oval or elongated shape is found towards the abdomen: it is covered, on the abdominal aspect, by the peritoneum.*

At the upper and anterior part of the limb, the *fascia lata*, or fascia of the thigh, consists of two portions, an external and an internal, with distinct insertions. The former, which is the thickest and strongest, covers the *sartorius* and *rectus femoris*, and is inserted into *POUPART's* ligament, from the anterior superior spine of the ilium to the inner edge of the femoral vein. The latter, thinner and weaker, covers the *pectineus* and *adductor* muscles, and is inserted into the pubes† in front of the origin of the *pectineus*. It passes behind the femoral vessels, and is there continuous with the *iliac fascia*, while the external portion covers these vessels anteriorly, just below the crural arch, and the vessels themselves are consequently situated between these two divisions of the fascia.

Under the anterior portion of the crural arch a large oval depression is found in the front of the thigh, on the surface of the *pectineus* muscle.‡ At the upper, outer, and lower sides, this hollow is bounded by a sharp and defined edge of the fascia; but it has no such boundary internally. Where the attachment of the *fascia lata* to the crural arch

* The exact distances of the parts above described from each other, as well as from the anterior inferior spine of the ilium and the symphysis pubis, may be seen from the measurements already given; see *ante*, p. 201, note.

† *SCARPA* represents that this portion is inserted, not into the bone, but into *GIMBERNAT's* ligament, in front of the pubes. “Arrivée pres de l'insertion du ligament de *FALLOPE* au pubis, elle passe au-dessous de la lame externe et s'insère tout le long de l'axe longitudinal du ligament de *GIMBERNAT*, qui se trouve ainsi divisé en deux parties, l'une supérieure ou antérieure, l'autre inférieure et postérieure ou interne.” *Supplément au Traité Prat.* p. 35, pl. 13.

‡ *BICHAT*, in describing the fascia of the thigh, says, “Elle est percée de divers trous pour le passage des vaisseaux et nerfs. Le plus remarquable de ces trous est celui qui, placé sous le ligament de *FALLOPE*, au devant du *pectiné*, donne passage à la veine saphène.” *Anat. Descr.* tom. ii. p. 309. It is strange that so remarkable a feature in the anatomy of the fascia should have been entirely overlooked by *SOEMMERRING*, both in his account of the fascia, and of the vein. *De Corp. Hum. fab.* tom. iii. § 281: and tom. v. § 263.

terminates, it forms a distinct semi-lunar or crescent-shaped fold.* The upper end, or horn† of this crescent, passes in front of the femoral vessels, just as they emerge from behind the crural arch, and bends a little under POUPART'S ligament, so as to unite with the thin portion or border of the arch, called GIMBERNAT'S ligament, at its commencement.‡ The concavity is turned towards the pubes, or the opposite limb. The fold passes straight downwards on the thigh, for an inch and a half or two inches, and then turns inwards and upwards, to form by its inferior horn,§ the lower boundary of the oval space, presenting a strongly marked semi-lunar edge, with the concavity turned upwards.|| Here

* This part is represented in the first plate of Sir A. COOPER'S work on inguinal hernia, although it is not marked by any letter of reference. Its upper extremity is particularly seen in the 4th, 5th, and 6th plates of Mr. HEY'S work, edit. 3d. But Mr. A. BURNS of Glasgow has described it the most minutely, under the name of the *falciform process* of the fascia lata, in "*Observations on the Structure of the Parts concerned in Crural Hernia*," contained in the 2d vol. of the *Edinburgh Medical and Surgical Journal*, p. 265—274, with two plates. In describing that portion of the fascia lata, which is fixed to the crural arch, Mr. BURNS gives the following account of the falciform process. "Just where this layer ceases to arise from the arch, we find the superficial vein entering, and therefore this vein is not covered with the inner or principal layer of the fascia, and, on dissecting away the vein, we see still better the structure of these parts: we find that the fascia stops just at the entrance of this vein, and, in many cases, it terminates abruptly with a neat, firm margin, which is traced some way down the thigh. The edge is lunated, and the concavity is directed towards the pubes or superficial vein. This is the usual appearance of the parts; sometimes, however, the structure is not quite so distinct, for occasionally a considerable quantity of reticular cellular texture is placed above, and adheres to the crescentic margin of the fascia. Nevertheless, in every instance, this lunated edge may be discovered, by passing the finger from the abdomen through the crural ring, and pressing outward; and by dissection it may be clearly demonstrated in emaciated anasarctous subjects."

† *Cornu superius annuli cruralis anterioris*: A. K. HESSELBACH.

‡ SCARPA, *Supplément*; pl. 12. This connexion is well represented in the figures of Mr. HEY'S work already referred to; in the first edition of which, at p. 151, he describes the part formed by this junction under the name of *femoral ligament*, an expression which is not retained in the subsequent editions.

The leading points in the anatomy of femoral hernia; viz. the protrusion of the viscera on the inner (mesial) side of the iliac vein; their strangulation by a part of the crural arch, which is felt when the finger is thrust down towards the thigh in this direction; and the important practical fact, that the division of this part is the best way of relieving the stricture, were ascertained by Mr. HEY from his own experience, and are correctly stated in his excellent *Practical Observations*, which constitute a valuable addition to the records of surgery.

§ *Cornu inferius annuli inguinalis anterioris*: A. K. HESSELBACH.

|| This must be the part described by Mr. BURNS in the following passage: "About an inch and a half below the crest of the pubes, the pectineal aponeurosis sends off a process or duplicature, to be inserted into the under surface of the fascia, at a very little distance from the falciform process; and this

the two divisions of the fascia lata are continuous. On the inner side the oval depression is not defined by any boundary. The fascia covering the pectineus is continued behind the femoral vessels, and the handle of a scalpel may be passed along its surface in this direction, so as to elevate them.

The oval space just described, constituting the lower or anterior opening* of the crural canal, gives passage to the internal saphena vein, and to the great lymphatic trunks of the lower extremity. It is larger in the female than in the male; but is occupied by a more dense tissue in the latter. The deep-seated inguinal glands and the large absorbent trunks fill it up: when these are removed, a small portion of the femoral vessels, of the vein principally, is brought into sight.

The *femoral* or *crural canal*† is the short passage extending from the superior or posterior opening already described to this inferior aperture, varying in length from about half an inch to nearly an inch and a half, and constituting an imperfect fibrous sheath for the femoral vessels. The anterior wall of this canal is short, consisting merely of the falciform process of the fascia lata or the superior horn of the anterior crural ring.

According to Sir A. COOPER, the sheath of the femoral vessels is formed in front by the inner portion of the fascia transversalis. (See *ante*, p. 190.) He says that the falciform edge of the fascia lata is connected to the sheath in front, and serves to strengthen it; but that, when this fascia has been dissected away, “the femoral artery and vein still remain inclosed in a sheath. The anterior part of this sheath appears at first sight to arise from the crural arch, but it may be readily detached from it by pressing the finger be-

duplicate divides the superficial vein and lymphatics, which enter with it, completely from the large vessels lying beneath the fascia; and over the edge of this process we in general find an oblong conglobate gland folded, one half stretching beneath the aponeurosis; the other descends above it, and thus between the two portions this duplicature is interposed. On the outer side of the duplicature we discover the vena saphena lying in a hollow, or channel, which is covered only by the superficial thin layer of fascia, and which leads us up to the crural foramen of GIMBERNAT, situated between the great vein and the crescentic fold at the pubes; and in femoral hernia it is in this hollow, which may be called the vagina of the saphenic vein, that the gut is lodged.”

* *Ouverture inférieure du canal crural*; J. CLOQUET. *Orifice antérieur du canal*; BRESCHET. *Vordere Schenkelring*; *annulus cruralis anterior*; A. K. HESSELBACH.

† See J. CLOQUET, *Recherches anat.* p. 66, et seq.

hind the arch, when it will be found to be a continuation of the fascia transversalis.”—“Through the inner side of the sheath near to the pubes, pass the femoral absorbent vessels into the abdomen; in the male subject I have seen them enter the sheath in a cluster, through a single hole in this fascia; but in both sexes the fascia is generally rendered cribriform by these vessels passing through a variety of small openings; but, nevertheless, if the sheath be clearly dissected, and the finger thrust into it from the abdomen, the cellular membrane and absorbent vessels are protruded through one of these holes which is larger than the rest; some of the absorbents also pass between the artery and the vein, and in some subjects even on the outer side of the artery, entering by two small openings in the anterior part of the sheath.”*

Mr. KEY gives a similar representation in his instructions for the dissection of these parts. After directing that the fascia transversalis should be exposed externally by reflecting successively the muscles that cover it, and that the peritoneum should be removed on the inside so as to bring into view the opening, by which the iliac vessels leave the pelvis, he says, “The fascia transversalis [*i. e.* its inner portion] being detached from GIMBERNAT’s ligament, may now be easily separated from the posterior edge of the crural arch by the handle of the knife, and the continuation of the fascia to form the femoral sheath may be seen. The knife may now be passed between the fore part of the sheath and POUPART’s ligament, and divide the latter so as to remove any constriction arising from GIMBERNAT’s and POUPART’s ligaments; let the finger be introduced into the mouth of the femoral sheath; notwithstanding the entire removal of the above ligaments, a band will be found stretching across the forepart of the sheath, and presenting a very evident cause of constriction to a femoral hernia.”†

In the following passage Sir A. COOPER enters into further details respecting the anatomy of the sheath enclosing the femoral vessels. “If the sheath be opened, the contents will be found separated by two membranous septa, one passing between the artery and vein, and the second, equally distinct, between the vein and the absorbents; the septum is formed by a process from the fascia transversalis passing backward, to attach itself to the fascia iliaca. The

* *Part i.* p. 9, edit. 2.

† *Ibid.* p. 12.

contents of the sheath differ in their attachment to the bag; the artery and vein are seen completely filling up the space in the sheath which is allotted to them; while the absorbents are loosely connected by means of cellular membrane and fat, which, not affording sufficient resistance to the pressure of the abdominal viscera, occasionally allows the descent of a hernia. It is this opening in the inner part of the sheath, occupied by the absorbent vessels and cellular membrane, to which the term *femoral aperture*, as allowing the descent of a hernia, should be strictly applied. This aperture is situated between the lunated edge of GIMBERNAT'S ligament, and the inner side of the femoral vein. When viewed from the abdomen, after the peritoneum is removed, it appears filled with cellular texture, which, being elastic, readily allows the finger to pass for an inch below the crural arch. If the finger be pressed forwards against the arch, the posterior edge of the latter may be distinctly felt; and even when POUPART'S ligament is cut away, a tendinous unyielding band will be felt on the forepart of the sheath, where the latter is united to POUPART'S ligament.*

The posterior and longer wall of the crural canal, reaching from the back edge of the internal to the inferior horn of the external crural ring, consists of the deep-seated production continued from the iliac fascia over the pubes and the pectineus muscle.

The femoral artery and vein, with trunks of absorbing vessels, surrounded and connected by a compact cellulofibrous tissue, occupy the femoral canal. They are covered in front, immediately below the crural arch, by the falciform process of the fascia lata; but a small portion of the vein on its inner side, is not covered by this process, and the sheath of the vessels is here completed by a dense fibrous substance. The great saphena vein passes over the inferior horn of the falciform process to join the femoral at this part; its opening into the femoral vein being about an inch below the crural arch.†

The superficial fascia, which has been already described, (see ante, p. 184,) covers externally the crural arch and neighbouring parts.

The crural arch, and the adjacent tendinous expansions,

* *Ibid.* p. 10.

† These parts are well delineated by M. BLANDIN; *Anatomie topographique*; pl. vi. The sheath of the femoral vessels is clearly represented by Mr. J. CLOQUET, in the 2nd and 3rd plates of his *Recherches Anatomiques*.

are a complex subject, which cannot be understood from description alone.* The different parts of this structure are designated by particular names; and these are supposed to belong to distinct and separate organs. Let the student constantly bear in mind that these are all intimately connected, and that the different names indicate portions of one continuous expansion. The iliac fascia is merely a part of the fascia lata: the thin border of the crural arch and the semi-lunar portion of the fascia lata are so intimately connected that no just idea can be formed of them in an insulated state. This general connexion maintains all the parts in a condition of mutual tension, which is materially affected by the position of the thigh, in consequence of the attachment of the femoral aponeurosis to the crural arch. The latter is drawn downwards by this insertion, so as to describe a convex line towards the thigh. When the limb is extended, rotated outwards, and carried in the direction of abduction, the parts are in the greatest tension. The semi-lunar edge of the fascia, and the posterior border of the crural arch, which, at the point of their junction, form the upper boundary of the crural ring, are then found to press closely on the finger passed into that ring; and the crural arch itself is drawn downwards as much as possible. By rotating the thigh inwards, bending it, and carrying it across the opposite limb, the parts are brought into complete relaxation, and the pressure on the finger is sensibly diminished.

* These parts should be dissected both from before and behind. In the former case, after removing the integuments, the superficial fascia, with the absorbent glands, and some cutaneous veins, is brought into view. When these are dissected away, we see the attachment of the fascia lata to the crural arch; the termination of this portion in the lunated edge, over the femoral vein; its contiguity behind the saphena, by a second semi-lunar edge, with the pectineal portion of the fascia; the insertion of the latter into the pubes, or, according to SCARPA, into GIMBERNAT's ligament; and the oval depression in which the saphena is placed at its termination. By detaching the lunated edge of the fascia from the crural arch, the femoral artery and vein will be exposed, and if these are cut across and turned upwards, the continuation of the fascia lata from the pectineus muscle, behind them, and over the pubes, to constitute the fascia iliaca, is brought into view. When the peritoneum is separated from these parts on the inside, the iliac portion of the femoral fascia (fascia iliaca) is exposed, with the iliac vessels lying on it: its connexion with the crural arch; the broad insertion of the arch into the spine and crista of the pubes; its crescentic edge, and the space between this margin and the iliac vein, called the femoral ring, are also seen. By dividing either the thin border of the arch, or the semi-lunar edge of the fascia near the arch, the mutual tension of these parts is destroyed.

SECTION II.—ANATOMICAL DESCRIPTION OF THE FEMORAL RUPTURE.

This rupture passes out of the abdomen through the space named the crural ring, or upper opening of the crural canal, which is situated under the crural arch, and between its thin border and the external iliac vein. Protrusion of viscera under other parts of the tendon is prevented by the attachment of the iliac fascia. The situation of the descent has been rightly stated by POTT;* but it is erroneously represented in several works of high authority. PETIT† and SABATIER‡ speak of the parts descending in some cases over the psoas magnus and iliacus internus. CALLISEN§ states, that the iliac vessels may be found behind, or on either side of the tumour: and even RICHTER,|| who says that the parts commonly protrude in the situation above described, mentions that they sometimes come down before, and sometimes on the outside of the iliac vessels. All those who have taken the trouble to investigate carefully the structure of the parts in the natural and ruptured condition, represent the fact as I have stated it above: GIMBERNAT, HEY, MONRO, COOPER, SCARPA,¶ and other modern writers,** are unanimous on this point. Hardly any instance of hernia under the crural arch has been hitherto recorded, except at the crural ring.†† It is true, indeed, that the swelling of

* *Works*, vol. ii. p. 152.

† *Traité des Mal. Chirurg.* tom. ii. p. 249.

‡ *Médecine Opératoire*, tom. i. p. 143.

§ *Systema Chirurg. hodiern. pars post.* p. 495.

|| *Traité des Hernies*, p. 242. RICHERAND, whose system, although recent, contains none of the late additions to our knowledge on this subject, has the same erroneous statement. *Nosographie Chirurg.* tom. iii. p. 400.

¶ *Mem.* iii.. § ii.

** LE DRAN, *Obs. de Chir.* tom. ii. p. 2; MORGAGNI, *Epist.* xxxiv, art. xv: ARNAUD, *Mem. de Chir.* tom. ii. p. 768; BERTRANDI, *Trattato delle Operazioni*, tom. i. annot. p. 218; DESAULT, *Tr. des Mal. Chir.* p. 191—195; NESSI, *Instit. Chirurg.* tom. ii. p. 198; LASSUS, *Méd. Opérat.* tom. i. p. 198.

†† Some writers have spoken of crural herniæ above the crural arch. In the 3rd section of chap. ix., I have noticed a case of this kind, which appears to have been an inguinal hernia, that had not passed the lower opening of that canal, (see *ante*, p. 220.) Dr. HULL has rightly referred such cases to the inguinal or ventral species. *Med. and Phys. Journal*, vol. xi. p. 49.

The other instances of crural hernia, in which the parts have been pro-

a crural rupture extends laterally in the bend of the thigh, and therefore may be said, in many cases, to lie in front of the iliac vessels; but the mouth of the sac, or the part at which the viscera are protruded, is on the inner side of the vein, even in the largest crural herniæ.*

The viscera descend from the abdomen at first nearly in a perpendicular direction, and come into the hollow in front of the pectineus. Since the motions of the thigh, and the more close adhesion of the integuments to the subjacent parts resist the progress of the tumour downwards, and the larger quantity of cellular and adipous substance at the bend of the limb offers less resistance, the rupture comes forward to the surface, so as to lie in general in front of the crural arch. For the same reason it extends outwards, or towards the ilium, assuming an oblong shape, with the long axis parallel to the crural arch. In consequence of this structure, the *body* of the sac forms a right angle with the *neck*; and that part of it, which, if it had continued to descend in a straight direction, would have been the lowest part of the bag, or the *fundus*, is actually the anterior portion.

That portion of the sac, which lying under POUPART'S ligament, may be called its neck, is generally about half an inch in length, and is frequently more: its dimensions indeed correspond exactly to those of the crural canal. When we consider that the point of departure from the abdominal cavity is at the thin posterior margin of the crural arch called GIMBERNAT'S ligament, and that the parts are covered by a considerable thickness of adipous substance, we shall expect to find the mouth of the sac at a great distance from the surface.

The viscera descend over the pubes, where the pectineal portion of the fascia lata, after closely covering the muscle, is inserted into the bone; hence the tumour is situated in front of the pectineus, and of the fascia lata. It is necessary to be more explicit on this point, as surgeons have generally supposed that the femoral rupture is covered by the fascia of the thigh;† and it is even stated that, in per-

truded in front of the femoral vessels, or between them and the anterior superior iliac spine, are noticed at the end of this chapter under the head of *Varieties of Crural Hernia*.

* See the case of immense crural hernia related in the next chapter.

SCARPA found the neck of the sac in the same situation in a similar instance of enormous crural rupture. *Supplément*, p. 41.

† This opinion will be found in most surgical books: that it is retained, even in very modern works, will be proved by the two following quotations.

forming the operation, we may cut boldly through the integuments on this account. I suspected the truth of this representation, from having often looked in vain for the fascia in operations; and from observing that the tumour feels loose, and has a circumscribed edge, instead of being tense, and having that obscurely defined margin, which we should expect, if it were covered with the fascia. Dissection has shown that this suspicion was well grounded. If the integuments and cellular substance are carefully removed from a femoral rupture, we shall find that it lies on that portion of fascia, which, covering the pectineus, is inserted into the front edge of the pubes; and that, as it comes over the margin of the bone, to which the fascia is fixed, it must necessarily be placed on the anterior surface of that part.

The peritoneal sac of the rupture is covered by an exterior investment, named by Sir A. COOPER the *fascia propria*. This is generally thicker than the peritoneum, close and firm in its texture, and embraces the whole of the tumour, to the very neck. More or less adipous substance is interposed between it and the peritoneal covering of the rupture. Since the parts descend on the inner side of the vein, I am disposed to refer the origin of this fascia propria to the condensed fibrous substance, which completes the crural sheath on its inner or mesial side. The superficial covering is often consolidated at some parts with the fascia propria; and that again with the peritoneal sac.

Sir A. COOPER gives the following account of the fascia propria and its origin. "A thin fascia* naturally covers the opening, through which the hernia passes, and descends on the posterior part of the pubes. When the hernia therefore enters the sheath, it pushes this fascia before it, so that the sac may be perfectly drawn from its inner side, and the fascia which covers it left distinct. The fascia, which forms the crural sheath, and in which are placed the hole or holes for the absorbent vessels, is also protruded forwards, and is united with the other, so that the two become thus consolidated into one. If a large hernia is examined, the fascia

MONRO states, that a crural is less movable than a scrotal hernia, in consequence of it being immediately covered and bound down by the tendinous aponeurosis of the muscles of the thigh. *On Crural Hernia*, p. 56.

"We know also that the herniary tumour is in truth under the fascia." *System of Operative Surgery*, vol. i. p. 294.

* I have not found this on dissection.

is only found to proceed upwards, as far as the edge of the orifice on the inner side of the crural sheath, by which the hernia descends; but in a small hernia it passes into the abdomen as far as the peritoneum, and forms a pouch, from which the hernial sac may be withdrawn, leaving this, forming a complete bag over the hernia.”*

M. J. CLOQUET describes the upper opening of the femoral canal as being closed by “a membranous partition; which opposes the formation of crural hernia, as well as the introduction of the finger under the crural arch from above downwards. This partition constitutes a sort of cellulo-fibrous diaphragm, whitish, thick and firm in some subjects, simply cellular, weak and readily yielding to pressure in others.” He proposes to call it *septum crurale*. He describes it as arising from the margin of the crural ring, connected sometimes to the concave edge of GIMBERNAT’S ligament, and blended towards the outside with the sheath of the femoral vessels. It is pierced by openings for the lymphatic trunks. One of these openings, larger than the rest, is occupied sometimes by an absorbing gland, and will admit the end of the little finger, which feels strangulated by a kind of fibrous elastic ring. He adds, that the sac of the crural hernia sometimes pushes the septum crurale before it, sometimes passes through one of its openings, which may be the seat of strangulation.†

The upper end of the falciform process passes over the upper and outer part of the neck of the tumour; it is then folded under the crural arch, and continues into the thin posterior border. The iliac vein is placed on its outer side; the pubes is directly behind it; and the upper and inner parts are bounded by the thin posterior edge of POUPART’S ligament. It is this part which forms the strangulation, as any person may easily ascertain, by passing his finger into

* Pt. ii., pp. 6 and 7. Some casual notices may be found of the structure of the sac in crural hernia. MORGAGNI observed, in dissecting such a case, “that the hernial sacculus was thick, and easily divisible into many laminae of coats.” Lett. xxxiv. art. xv; MAUCHART also noticed the fact, “Saccus herniosus etiam in hernia crurali duplex est,” &c. See HALLER, *Disp. Chir.* tom. iii. p. 152. But it was not generally understood until the publication of Sir A. COOPER’S work.

† *Recherches anat.* p. 73. I have not found, in this situation, anything properly deserving the name of “thin fascia,” or “membranous septum;” and I think that the student will generally be disappointed in his attempts to discover such structures.

the neck of the sac, or by thrusting it, in the healthy subject, into the corresponding part. The merit of first discovering and of making public this fact is due to GIMBERNAT.

The semi-lunar portion of the fascia, being attached to the crural arch at the point at which the hernia comes out, contributes in some degree to the strangulation, as we may ascertain by passing the finger in the course of the rupture. Indeed the upper boundary of the crural ring is formed by the continuity of the falciform process with the thin border of the crural arch: and, as this is the seat of the stricture, both these parts are concerned in forming it. Hence the stricture is relieved by relaxing this process. It is not, however, so essentially concerned in producing the incarceration as the thin posterior border of POUPART'S ligament.

In the second part of his observations on hernia, Sir A. COOPER has entered very minutely into the description of the anatomy of the crural arch, both in the natural and ruptured state. According to his representation, the viscera contained in a crural rupture are protruded in the first instance into the sheath surrounding the femoral vessels: from which they escape through the openings, formed for the passage of the lymphatics of the lower extremity. Hence it follows, that the most frequent seat of strangulation is in the margin of this opening. My own examinations of the subject have led me to refer the cause of stricture to the thin posterior border of the crural arch, at the part where it is connected to the falciform process, and I have hitherto found no reason to change my opinion on that subject. The difference does not appear an important one; nor can it influence the mode of operating.*

The epigastric artery passes obliquely upwards and in-

* SCARPA expressly states his dissent from the representation of Sir A. COOPER on this subject, and his opinion, that the sac passes out between the concave edge of GIMBERNAT'S ligament and the side of the femoral vein; *Supplément*, p. 42.

The following quotation exhibits the opinion of M. CLOQUET on the same subject.

“ Dans les hernies crurales, le sac peut descendre tout le long du canal du même nom, et sortir par son ouverture inférieure (trou pour la veine saphène.) Le plus souvent il passe par une ouverture arrondie que présente ce canal, tout près du ligament de GIMBERNAT. Quelquefois il sort par les trous de sa paroi antérieure. Enfin je l'ai vu s'engager par une ouverture de la paroi postérieure. Il reposait immédiatement sur le muscle pectiné, et avait au-devant de lui l'artère et la veine fémorales, dont il était séparé par le feuillet profond de l'aponevrose fascia lata.” J. CLOQUET, *Recherches Anat.* p. 85.

wards on the outside of the hernial sac ; and is situated at the distance of half an inch from the neck of that part.*

The obturatrix artery is frequently produced by the epigastric ;§ in which case it may either go on the outer

* “L’artère épigastrique,” says SCARPA, “néé de l’iliaque externe, près l’arcade crural, à neuf lignes de l’anneau crural, se dirige obliquement de dehors en dedans et remonte vers la ligne blanche, distante de quatre lignes du col du sac herniaire et du côté externe de l’anneau crural. *Supplément*, p. 52.

† M. J. CLOQUET examined the origin of the obturatrix artery in 250 subjects, half male and half female. He found it to arise—

| | | | |
|--|-----|---|-------------|
| 1. From the internal iliac on each side, in..... | 160 | { | 87 males. |
| | | | 73 females. |
| 2. epigastric, | 56 | { | 21 males. |
| | | | 35 females. |
| 3. internal iliac on one side. | 28 | { | 15 males. |
| epigastric on the other | | | 13 females. |
| 4. crural | 6 | { | 2 males. |
| | | | 4 females. |

In the entire number there were,

| | | | |
|--|-----|---|--------------|
| Obturatrix arteries from the internal iliac..... | 348 | { | 191 males. |
| | | | 157 females. |
| epigastric | 152 | { | 58 males. |
| or crural | | | 94 females. |

Recherches anat. p. 72, note.

A similar examination by A. K. HESSELBACH in 32 subjects gave the following results, in which the two sides are reckoned separately.

| | |
|---|----|
| The obturatrix arose from the internal iliac in | 36 |
| epigastric | 23 |
| femoral..... | 3 |
| by a trunk common to it with the epigastric and | |
| circumflexa ilii, from the femoral | 1 |
| Epigastric and circumflexa interna | 1 |

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Ueber den Ursprung und der Verlauf, &c. p. 26.

HESSELBACH also observed in three instances an anastomosis between the epigastric and obturatrix by means of a considerable artery, placed immediately behind the crural ring. His third plate presents a delineation of this variety, which had been noticed by PORTAL (*Anat. Med.* t. 3, p. 322) and MONRO (*on the gullet, &c.* p. 427.) The occurrence of this variety in a case of crural hernia has not yet been noticed ; so that we do not know what relation this communicating branch would bear to the mouth of the sac.

M. VELPEAU has made a statement respecting the proportion of instances, in which the obturatrix artery arises from the epigastric, differing remarkably from the representations of J. CLOQUET and J. K. HESSELBACH. “L’examen que j’ai pu en faire sur plusieurs milliers de cadavres, soit dans les hôpitaux, soit dans les amphitheatres de dissection, soit à l’école pratique, ne me permet pas de dire qu’elle se rencontre un fois sur trois, ni sur cinq, ni même sur dix, mais bien seulement sur quinze à vingt.” *Nouv. élém.* tom. ii. p. 480.

The experience of TIEDEMANN coincides with that of CLOQUET and HESSELBACH : he says, “I have seen this distribution very frequently. In three bodies you may expect to find the obturatrix arising from the epigastric once on one or the other side, or perhaps on both. The variety is more common in the female than in the male.” *Explic. tab. arter. corp. human.* p. 295.

MONRO has seen the obturatrix arise from the superficial femoral, ascend

side* of the sac to the obturator foramen, or it may pursue its course along the inner margin. In the latter distribution the neck of the sac would be surrounded by a large vessel in three-fourths of its circumference. The iliac vein is on the outside; the common trunk of the epigastric and the obturator vessels would lie on the front, and the obturatrix artery itself would be found on the inner margin of the sac.

While these sheets were passing through the press, Mr. WORMALD pointed out to me in the dissecting-room of St. BARTHOLOMEW'S, an example of the obturatrix artery arising from the epigastric. The former made a considerable sweep in turning down to the obturator notch, running behind the crural ring in such a manner, that a protrusion might have taken place either on its inner or outer side. A similar arrangement is seen in four crural herniæ in the museum, in which this origin of the obturatrix exists, the artery being on the outer side of the rupture in one, and on the inner in the other three. Mr. WORMALD therefore in-

along the pectineus and enter the pelvis at the crural aperture. It is placed behind the crural hernia in this case. P. 430.

The origin of the obturatrix from the internal iliac is represented by TIEDEMANN, tab. 25, 26, and 30, fig. 4.; from the external iliac, tab. 30, fig. 1; by a common trunk with the epigastric from the external iliac, tab. 33, fig. 2, by J. K. HESSELBACH, and by Mr. HEY, *Practical Observations*; ed. 3rd, pl. 1, by a common trunk from the femoral, tab. 33, fig. 4.

* This, which is the usual course, is delineated by Dr. MONRO, in his *Morbid Anat. of the Gullet*, &c. pl. xv. fig. 1.

The Doctor adds, "when the trunk common to the obturatrix and epigastric arteries is of an inch or an inch and a-half in length, the obturator artery is then situated between the symphysis pubes and the hernial sac, and sometimes follows the same course as that part of the crural arch called GIMBERNAT'S ligament, of which I have seen several examples." Ibid, p. 428. He does not, I presume, mean to assert that he has seen several examples of the obturatrix artery situated on the inner side of the neck of the sac, for he has not delineated this arrangement; and its occurrence is so rare that Sir A. COOPER has not met with it. In a subsequent passage Dr. MONRO states that he has seen three cases (p. 485). An instance, in which Mr. A. BURNS observed it, is mentioned in the work of Dr. MONRO, *ibid.* p. 483; Dr. BRESCHET mentions an example, which was observed by Mr. DUCROS of Marseilles; *Concours, &c.*; obs. xxviii, p. 153. Another case is quoted by SCARPA (*Supplément*, p. 83) from LEBERECHT, *Diss. de extensionis in solvendis herniis cruralibus incarceratis, præ incisione præstantia*; Berlin, 1816. The following quotation shows that CLOQUET had observed it. "Quand l'artère obturatrice naît de l'épigastrique, elle peut se trouver en dehors, (c'est le cas le plus fréquent,) en dessus et en dedans, ou bien en dessous du sac. Je conserve des pièces d'anatomie pathologique où l'on observe ces variétés dans la position de l'artère obturatrice." *Recherches Anat.* p. 86.

The museum of St. BARTHOLOMEW'S Hospital contains two examples of double femoral hernia in the male with the obturatrix arising from the epigastric artery on each side. In three out of the four ruptures, the former vessel runs on the inner side of the mouth of the sac.

fers that its situation in relation to the neck of the sac depends on the course and position of the vessel itself, and not, as Dr. MONRO had conjectured, on the length of the common trunk, which may vary from two lines to an inch and a-half.

Dr. MONRO represents that when the obturatrix arises from the external iliac, it passes first on the front of the hernial sac and then descends along its inner side.* It may be doubted whether he has seen such a course of the vessel in a crural rupture; for he does not expressly say so, and I have met with no instance of the kind in any other writer.

Sir A. COOPER found the obturatrix arising from the epigastric artery in six out of twenty-one preparations of crural hernia. He adds, that this origin is more frequent than the proportion indicated by the above statement, but that the position of the artery in passing over the crural aperture, has some tendency to prevent protrusion. In all the instances, which Sir ASTLEY had dissected, of this variety in the origin of the obturatrix co-existing with crural hernia, the artery had passed on the outer side of the neck of the sac †

The spermatic cord and the round ligament of the uterus pass directly over the superior part of the swelling; and are not more than half an inch distant from the mouth of the sac. ‡

The contents of the crural rupture are generally the same as in the inguinal, that is, intestine or omentum, or both. Intestine is the part most frequently contained:

* *Ibid.* p. 430.

† *Part ii.* ed. 2, p. 26. After mentioning this variety, TIEDEMANN says, that under such circumstances the obturatrix artery runs along the anterior and inner side of the hernia in its course to the pelvis. *Explic. tab. arter.* p. 295. J. K. HESSELBACH mentions that, in the cases examined by him the obturatrix artery, arising from the epigastric, pursued a dangerous course in 19 instances; meaning thereby, as I presume, that if crural hernia had taken place in those instances, the artery would have been found on the inner side of the mouth of the sac. It took a safe course in one instance only. We can attach no weight to these representations, as they are obviously not founded on dissections of herniæ.

‡ A case dissected and figured by Mr. J. CLOQUET affords the only instance I know of an exception to this arrangement. An external inguinal and a crural rupture, were found on the same side. The spermatic cord, passing along the inner side of the neck of the crural sac, joined the crural arch at a right angle. Probably the inguinal rupture had formed first, and, by displacing the epigastric artery and cord towards the pubes, had facilitated the occurrence of this peculiarity. *Recherches Pathol.* p. 82, note, pl. vii. fig. iv. and v.

omentum is seldom found alone; Sir A. COOPER states that he has seen it only twice.* I have met with it more frequently. A. K. HESSELBACH† saw the ovarium and Fallopian tube in a crural hernia of the left side. The broad ligament of the uterus had been drawn out of the abdomen in this case, in the gradual enlargement of the hernial sac, and contributed to the formation of its posterior surface.

VARIETIES OF CRURAL HERNIA.

This rupture may be either *complete* or *incomplete*. In the former case, the parts, having quitted the canal below the crural arch, form a swelling under the integuments. In the latter, they are contained in the canal; that is, they enter its upper or posterior orifice, and are contained in the sheath of the crural vessels, not emerging from the lower or anterior opening of the canal. The swelling in the latter case is covered by the fascia lata; it consequently has an ill-defined margin, and is altogether more obscure to the feel. This incomplete form of the complaint is of rare occurrence; the observations therefore in the present work are to be understood as applying to complete crural herniæ, unless where it is otherwise expressly stated.

The incomplete variety of the complaint has been described by Sir ASTLEY COOPER, who says, "The appearance of this disease is that of a general swelling of the fascia on the inner side of the femoral vein, but without its producing any circumscribed tumour. The part swells whenever the patient coughs or uses any considerable exertion, but the swelling diminishes, though it does not entirely subside, when he stands at rest. I have given a plate of this disease from a dissection which I made, and believe it to be not an unfrequent variety, as I have met with it three times in the dead body, and it existed on both sides in each. In this case the hernial sac descends as usual on the inner side of the femoral vein; but instead of passing out of the sheath at the place at which the absorbents enter, it is continued downwards within the sheath, passing anteriorly to the femoral vein, and descends as far below the crural arch, as the sheath will allow, the distance being in general from two to three inches.

* Part ii.; ed. 2, p. 5.

† *Lehre*, &c.; p. 157.

This species of hernia is very easily reducible, and, I believe, is little liable to become strangulated, as the mouth of the sack is of considerable size. A truss should be applied in this hernia, both to prevent its increase and to obviate the danger of its passing out of the sheath in the usual manner.”* We may conclude that Sir ASTLEY had not seen this hernia strangulated, as, in alluding to the operation, he merely speaks hypothetically of what should be done if it “were to become strangulated.”

Distinction of crural hernia into internal and external.—The parts are protruded almost invariably on the inner side of the femoral vein: the principal writers on the subject, including Mr. HEY, Sir A. COOPER, and SCARPA, had never seen any deviation from this course, which must therefore be extremely rare. Some instances have however been noticed, in which the rupture has occurred in front or on the outer side of the femoral vessels. J. CLOQUET says, “The epigastric artery may be found on the inner side of the sac of crural hernia, the parts having descended in front of the femoral vessels. I have only a single observation of this kind. Is this a sufficient ground for distinguishing crural, like inguinal herniæ, into external and internal. I think it is.”†

A. K. HESSELBACH also divides crural hernia into internal and external. The former is the ordinary kind of crural rupture described in this work: of the latter he had seen only one case, in which the parts did not descend in front of the femoral vessels, as in the rare example just quoted from CLOQUET, but between these vessels and the anterior superior spine of the ilium. The tumour was covered not only by the fascia lata, and partly by the sartorius; but also by the portion of fascia continued over the iliacus internus and psoas magnus below the crural arch, (*fascia iliaca anterior*; HESSELBACH.) The circumflexa ilii passed in front of the neck of the sac. A tumour thus situated must have been small and but slightly prominent; it would have had an obscurely defined margin. HESSELBACH says, that the mouth of the sac was the widest part of the protrusion; and therefore that it could hardly have become incarcerated.‡

In reference to the same subject, Mr. MACILWAIN has

* Part ii. ; p. 25. Plate viii. fig. 1.

† *Recherches anatomiques sur les hernies* ; p. 85.

‡ *Lehre*, p. 172—185.

the following statement respecting the records of the London Truss Society. "There are no less than six instances recorded of hernia occurring on the external side of the femoral artery. The cases were recorded by my predecessor, Mr. TAUNTON, senior, whose great familiarity with hernial tumours, combined with his accurate knowledge of the anatomical difficulties calculated to impede or embarrass any such cases, are to my mind satisfactory proofs that he could not have mistaken them. It should be recollected, that the number is but six in several thousand examples of femoral herniæ. This case can only happen, I conceive, from some imperfection in the structure of POUPART'S ligament. I have seen many cases in which the strength of support given by POUPART'S ligament has been palpably less than is usual."* As the situation, at which the protrusion had occurred, was not ascertained by examination after death in either of these six cases, it will remain doubtful whether they really presented examples of deviation from the ordinary situation of femoral hernia.

Mr. STANLEY has informed me that he had met with two instances of external femoral hernia in the dead body. In each of these, the sac was small, widest at its mouth, and empty : it passed out of the abdomen at the outer side of the femoral vessels, but close to them. The sac, about the size of a walnut, was placed directly in front of the femoral artery and vein. In one of these instances the epigastric artery arose from the femoral, and gave origin to the obturatrix. The common trunk and its division into the epigastric and obturatrix branches were placed in front of the sac.

Femoral hernia behind the femoral vessels.—M. CLOQUET states, in a passage already cited, that he had seen an instance, in which the rupture had passed through an opening in the posterior part of the sheath, so that it lay immediately on the pectineus, and behind the femoral artery and vein, being separated from these vessels by the deep-seated portion of the fascia. See *ante*, p. 480, note.

* *Surgical observations* ; p. 293.

CHAPTER XV.

SYMPTOMS AND DIAGNOSIS OF THE FEMORAL RUPTURE.

FEMORAL ruptures are most frequent in women, as the inguinal are in the male sex. The apparent reasons of this difference are the greater capacity of the inguinal canal in the male, and the larger size of the crural ring consequent on the greater breadth of the female pelvis.

Mr. HEY* had never met with any kind of strangulated hernia in females, but this. MORGAGNI† had never seen crural hernia in the male; and HEVIN‡ had only once operated on it in this sex. SANDIFORT§ and WALTER|| had each of them seen it only after death; while ARNAUD¶ had met with no opportunity of dissecting it in the male. It is, however, by no means so uncommon in men as these statements would lead us to expect. I have seen many instances of it; and Dr. BRESCHET** mentions that he had observed more than thirty cases, within a few years, in attending the practice of the Baron DUPUYTREN. MONIKHOF found, in sixty-eight persons affected with femoral hernia, fifty-one females, seventeen males. In these sixty-eight patients there were seventy-five femoral ruptures, forty-six on the right, twenty-nine on the left side; and there were seven instances of double rupture.††

* *Practical Obs.* p. 154.

† “Mihi, ut verum fatear, nondum nisi in feminis accidit ut eam viderem.” *Epist.* 34; art. 15.

‡ *Pathol. et therap.* p. 406.

§ *Obs. anat. pathol.* c. iv. p. 72.

|| *Sylloge comment. anat.* p. 24; obs. 21.

¶ *Mém. de Chir.* tom. ii. p. 782.

** *Considérations et observations anat. et physiol. sur la hernie femorale*, in his *CONCOURS*; p. 42.

†† A. K. HESSELBACH, *Lehre*, p. 147.

Femoral hernia is much more frequent in married women than in girls : ARNAUD* states that nineteen out of twenty married women, afflicted with hernia, have this form of complaint ; while in men and unmarried females, not one in a hundred has it.

It is rarely met with before puberty. Sir A. COOPER† had seen an instance at the age of seven, one at thirteen, and a third, strangulated, at nineteen. It is most frequent at the middle, and subsequent periods of life.

It may be combined with inguinal hernia on the same side, but this is not common. In the museum of ST. BARTHOLOMEW'S Hospital there is a specimen of internal inguinal and femoral hernia on each side, in a male.

Symptoms of femoral hernia.—The opening through which this rupture descends is small, and hardly admits of enlargement in any direction. From this circumstance, together with the indirect course of the protrusion, and the resistance to its development from the parts in the bend of the thigh, the swelling is generally small, and sometimes remarkably so, varying ordinarily from the bulk of a hazel nut to that of a walnut or a hen's egg ; occasionally, but rarely, it attains a much more considerable magnitude.

CASE.—A middle-aged woman was admitted into ST. BARTHOLOMEW'S Hospital with a femoral rupture of eight years' standing. It had generally admitted of partial reduction, and once, during a state of pregnancy, had entirely receded. Although the size of the swelling had been always very considerable, it had never occasioned any inconvenience, except from its bulk, until the time of her admission, when it measured nineteen inches across in the perpendicular direction, and twenty-seven inches in circumference. The integuments at this time had a red appearance, and the patient was in a state of considerable general weakness ; the strength gradually declined ; the integuments ulcerated and burst, so as to expose the intestines partially ; and about a gallon of serous fluid escaped from the opening. There was a constant discharge of the same fluid until the time of her death. Dissection showed that the protrusion had taken place in the usual situation under the crural arch, and that the sac contained the whole of the jejunum, ileum, cæcum, and ascending colon, with a large share of the omentum.

* P. 133.

† Part ii. ; edit. 2, p. 5.

Mr. HEY* mentions a similar instance to that which I have now related; and Dr. THOMSON,† the learned professor of military surgery in Edinburgh, has witnessed a case of the same description. In both of the last-mentioned patients the integuments had become so thin, in consequence of the increase of the tumour, that the peristaltic motion of the bowels could be distinguished.

In a case, which occurred to Mr. DALRYMPLE, the swelling reached to the middle of the thigh, and extended from the anterior superior spine of the ilium nearly to the tuberosity of the ischium. In the latter direction it measured fifteen inches and a-half; perpendicularly, eight and a-half; and it was large enough to hold three or four pints of fluid.‡

Dr. HULL§ saw a femoral hernia as large as a child's head in a man, and Mr. MACILWAIN|| met with an instance, in which the swelling had attained the same size in two years after an operation, the patient having refused to wear a truss.

The swelling, which is indolent, and presents the general characters of rupture, is situated in the upper, anterior, and inner part of the thigh, in the bend of the limb, or a little above or below it.

While the hernia is small, it is a roundish, firm or slightly elastic swelling, like an enlarged absorbent gland, placed under the anterior part of the crural arch. It is not easily discovered in fat persons. Such ruptures are dangerous, because they may be easily overlooked or mistaken; and, if strangulation occurs, the progress is acute. As it enlarges, it extends in the bend of the thigh, and assumes an oval or elongated shape, of which the long axis is generally parallel to the crural arch, and the two ends are rounded, the external being directed a little upwards, the internal a little downwards. It now lies over the anterior part of the crural arch. Sometimes, but rarely, instead of extending in the bend of the thigh, it descends, in the course of the femoral vessels along the anterior and inner part of the limb.

The tumour is deeply seated at its origin, it advances towards the integuments, and becomes more superficial. Surrounded by the adipous texture and absorbent glands

* *Practical observations*, p. 230.

† COOPER, *Part ii.*; p. 6.

‡ COOPER, *ibid.* edit. 2; p. 15.

§ *Medical and Physical Journal*; vol. x.

|| *Surgical Observations*; p. 292.

of this region, it projects externally more or less according as the patient is thin or fat. In subjects of the latter kind, a small portion only of the rupture presents under the integuments: when we dissect it, removing the skin, and clearing away the fat, we find the swelling larger than the external appearance would have led us to expect.

The surface is generally uniform; sometimes, however, from the unequal yielding of the coverings, or from inequalities in the contents, especially of the omentum, it presents irregularities nearly resembling those of some glandular enlargements.

When the protrusion is complete, and fully developed, the swelling, if traced backwards, passes deeply in the bend of the thigh, in the situation of the anterior crural arch, below and to the outside of the inguinal ring. The femoral vessels and the spine of the pubes are its boundaries, the former on the outer, the latter on the inner side. These are the limits at the base of the swelling: its outer and inner ends may extend over and cover the parts in question. If the rupture ascends towards the abdomen, as it usually does in its increase, we can draw it downwards, so as to ascertain that the crural arch is situated above it. This arch indeed is covered by the smaller upper portion only, while the larger lower part of the rupture lies on the thigh. If the swelling should increase to a large size, it still continues in the bend of the thigh, excepting in the rare case of its descending in the course of the femoral vessels.

Close to the outer edge, or behind this part of the swelling, we find the femoral vessels and feel the pulsation of the artery; on the inner side the spine of the pubes may be distinguished. The finger passed over the surface of this bone will enter the ring of the obliquus externus, and thus show that there is no protrusion through the inguinal canal.

If the rupture is reducible, its replacement will prove that the descent had occurred through the crural ring, which then remains open and will admit the end of the finger.

Diagnosis of crural hernia.—Of complaints, which cause swellings in the immediate neighbourhood of the crural arch, and may therefore be confounded with crural hernia, the following are the principal; namely, enlarge-

ments of the absorbent glands; inguinal ruptures, especially the incomplete and complete external kinds; lumbar abscess; varicous enlargement of the femoral vein.

Glandular enlargements.—When the femoral rupture is small, it may be mistaken for a glandular swelling, especially if it be omental and irreducible. A gland is often situated over the crural ring; and this, when enlarged, constitutes a tumour in the precise situation of the crural rupture.

A crural enterocele has an elastic feel; if the rupture be omental, it is generally firm, with some irregularity of surface. Swelled glands are firm without any sense of elasticity or fluctuation, and uniform, if the swelling comprise a single gland; while the several glands can generally be distinguished when more than one are engaged. The swelling of crural hernia admits but of little motion, especially in the lateral direction; enlarged glands are frequently so loose that they can be pushed aside, leaving the crural ring free, or they can be raised and the fingers passed under them, showing clearly that the swelling does not originate in that quarter.

The circumstances, which attended the origin and progress of the tumour, together with its present state and symptoms, generally enable us to decide upon the nature of the complaint, although the sensible characters of the swelling should be insufficient for the purposes of diagnosis. If it appeared suddenly after a violent effort; if it has already existed for a long time in an indolent state; if it increase in consequence of exertion, and diminish or disappear on pressure, or in the recumbent posture; if an impulse be felt when the patient coughs, and if intestinal affections have been caused by it, the case must be a hernia. The swelling of enlarged glands is generally harder than an unincarcerated hernia; it increases gradually; it does not disappear on pressure, nor in the recumbent posture, nor does it impede the functions of the alimentary canal.

If enlarged glands should have suppurated, there may be a sense of fluctuation, not readily distinguishable from the elasticity of a crural enterocele. The impulse on coughing in the latter case, and its absence in the former, will afford clear grounds of distinction. It is only in cases of chronic suppuration that doubt can exist. The characters of the swelling, in active inflammation of the glands, are so different from those of a rupture, that there is little

fear of mistake. Even if the bowels should be confined, the administration of aperients would soon remove all uncertainty.

The occurrence of the symptoms, which usually attend strangulated hernia, will remove any doubt that may have been previously entertained; and, if they do not yield to the usual remedies, will authorise the surgeon in operating, although the examination of the part should not satisfy his mind that the swelling is a hernia. We must remember further, that inflammation and suppuration of the glands may occur in conjunction with strangulated rupture, and that, in such a case, the inflamed glands cover the hernial tumour. In either case, the presence of urgent symptoms would authorise the operation; which would be necessary to save life, if the case were a strangulated rupture, while it would be uninjurious on the supposition of mere glandular enlargement and suppuration.

In a woman, seen by Mr. MACILWAIN* on account of a tumour in the groin, there was an enlarged and inflamed gland in the situation of femoral hernia, with an obscure impulse on coughing: poulticing, rest, and aperient medicine were ordered. At the end of a week, the swelling of the gland had subsided, and a small intestinal hernia was detected.

This gentleman saw another case, in which, after symptoms of enteritis had existed for some days, a tumour was discovered in the groin. It occupied the situation of the femoral ring, being rather nearer to the vessels than femoral hernia is usually found; and it could be brought forward more easily than might have been expected in strangulated rupture. It was moderately firm, smooth, and somewhat elastic, with an obscure feeling of central fluidity, and no tenderness or change of colour in the skin. Hiccup, nausea, stercoraceous vomiting, and absolute constipation were present. The other medical attendants agreed in opinion with Mr. MACILWAIN, that the swelling probably was not hernial, but that as its nature was doubtful, the parts should be cautiously divided to ascertain the real state of the case. It was found to be a gland, with a suppurating cavity in its centre, and without any protrusion from the cavity of the abdomen. The patient recovered.†

The foregoing considerations would undoubtedly have

* *Surgical Observations*, p. 307.

† *Ibid.* p. 308.

justified Mr. ELSE, if he had opened the tumour in the fatal case of crural hernia recorded in the fourth volume of the *Medical Observations and Inquiries*; for the want of fecal evacuations clearly pointed out the nature of the affection.

I have seen an hospital surgeon, a man of considerable practice and eminence in his profession, mistake a femoral hernia for a glandular enlargement, although the attendant symptoms sufficiently indicated the nature of the complaint. So strongly did the tumour in all its sensible characters resemble a swoln gland, that the operation was not performed, although the marks of strangulation were present; and the patient's death afforded an opportunity of ascertaining, that the complaint had been caused by a protrusion of the bowel. Sir A. COOPER informs us, that a surgeon in considerable practice sent into GUY'S Hospital a man with a crural hernia, which had been poulticed for three days on the supposition of its being a venereal bubo; and when the operation was performed, the intestine was found mortified. In another case the swelling was opened, under a similar mistake; the stools were discharged at the opening, and the patient soon after died.* Similar fatal errors are recorded by PETIT.† The importance of this subject, and the inevitably fatal consequences of a mistake, induce me to repeat what I have already observed, that the existence of symptoms justifies us in operating where the character of the tumour is doubtful. I will venture to add, that, if in compliance with this maxim, the surgeon should, under any unusual concurrence of circumstances, cut down on a merely glandular swelling, he will be acquitted in the opinion of every judicious practitioner; and his conduct will not be attended with any injurious consequence to the patient: if, on the contrary, he persists in preferring the testimony of his touch to the dictates of his reason and judgment, and refuses to operate, where the symptoms demand the use of the knife, he must be considered responsible for the death of the patient.

Inguinal hernia.—The incomplete external inguinal hernia, after distending the inguinal canal, sometimes extends, under the aponeurosis of the obliquus externus, towards the anterior superior spine of the ilium, and thus forms an elongated tumour parallel to the crural arch. The swell-

* Part ii. p. 8.

† Tr. des mal. chir. tom. ii., p. 293, et seq.

ling, however, is situated above the arch, while the femoral rupture is below it in the bend of the thigh, as we see clearly if we draw the swelling downwards.

This kind of rupture is above a line drawn from the anterior superior spine of the ilium to the spine of the pubes: the neck of crural hernia is below, but its upper edge will cover the line.

The circumference of the tumour is defined in crural hernia, and so far movable over the parts on which it lies, that we can carry the fingers under it: we are thus enabled to feel the continuation of the tumour, towards its inner end, into the anterior crural ring. We cannot embrace the incomplete inguinal hernia in the same manner, nor carry the fingers behind it, because it is covered and bound down by the aponeurosis of the obliquus externus.

In the latter case, the pulsation of the femoral artery will be felt below the middle of the swelling; while it is close to or behind the outer end in crural hernia. A femoral rupture has often been mistaken for an ordinary bubonocoele; and the error is not an improbable one, in consequence of the swelling, in the former case, lying, as it frequently does, on the crural arch. This mistake may occur more easily where the bony and tendinous parts are concealed by much fat. The surgeon may consider this mistake an innocent one, since the nature of the complaint, and the general measures required for its relief, are the same in both cases. He must change his opinion when he finds that the pressure, in the attempts at reduction, ought to be made in different directions in the two cases; and that the close connexion of various important parts with the crural hernia would expose him to the risk of some dangerous or even fatal mistake in performing the operation under such an erroneous notion respecting the situation of the rupture. The relation which the neck of the tumour bears to the crural arch, the pubes, the crural and the external abdominal rings, will enable the practitioner to distinguish the two cases.

The swelling of crural hernia covers the anterior crural ring, and leaves the abdominal ring open; while, in bubonocoele, the latter is covered, and the former open.

In crural hernia the swelling is oval, with the anterior and smaller end over the crural ring, the posterior and larger towards the ilium. In the inguinal rupture, the neck or smaller part is upwards, the larger part below.

If the swelling of a crural hernia be drawn downwards, the crural arch can be traced passing over the neck of the sac; while in bubonocoele it is found under the neck. The spine of the pubes, which is behind and below the neck of the sac in inguinal hernia, is on the same horizontal level, and rather within it in the crural species.

However large crural hernia may become, it remains in the bend of the thigh, or descends in front of the vessels, never passing, as the bubonocoele does, into the scrotum or labium pudendi.

In the region which those swellings occupy in the female, there is frequently so much fat, as to render their diagnosis difficult. In a doubtful case we should pass the finger along the bone from below upwards; if it enters the inguinal canal, that opening must be free, and we may therefore conclude that the rupture is femoral.

Inguinal ruptures in the male have an immediate and close connexion to the spermatic cord, which is wanting in the crural.

RICHTER has seen crural mistaken for the inguinal hernia frequently, even by persons of experience.*

PELLETAN says, “J’ai opéré de ces hernies, dont j’étois persuadé qu’elles avoient leur issue par l’anneau, et n’ai reconnu mon erreur qu’après avoir ouvert le sac.”†

The facility with which this mistake may be committed is probably the reason why the existence of crural hernia, as a distinct species, was so long overlooked. VERHEYEN, who published his *Anatomia Corporis Humani* in 1693, is generally considered to have been the first who noticed it. I subjoin the passage, as it contains an instance, in which the rupture caused no external swelling. “Alius huic vicinus locus est, ubi fiunt herniæ periculosæ et sæpe lethales; scilicet ubi venæ et arteriæ iliacæ tendunt ad crura.” After mentioning a fatal case, he adds, “Eundem casum invenio quoque observatum a Cl. D. NUCK; et, quod mireris, in utroque casu nihil exterius fuit observatum, quod referret herniæ speciem, neque ægri de aliqua in eo loco molestia fuerant conquesti, adeo exigua apparet causa istius mali.”‡

* *Tr. des hernies*, p. 243; and Sir A. COOPER has witnessed similar blunders.

† *Clin. Chirurg.* tom. iii. p. 27.

‡ Tract. ii. cap. vii. LE QUIN, however, seems to have known the femoral hernia before this time. See his *Tractatus de herniis* in the *Chirurgia Barbettiana*, in the works of BARBETTE, by MANGET, pp. 54, 55, and 74.

Psoas abscess.—The swelling formed under the crural arch in the case of psoas abscess may be mistaken for a crural rupture. It is an indolent tumour, which may be made to disappear, at least partially, on pressure, and in which coughing or holding the breath gives the feeling of impulse. The contents of the swelling are fluid; hence fluctuation may generally be perceived, and the swelling does not retire, as a rupture does, in the recumbent posture. As this kind of local affection is subsequent to the formation of an abscess in the neighbourhood of the psoas muscle, the preceding pain in the loins, aggravated on motion, and attended, perhaps, with shivering, accelerated pulse, night-sweats, loss of flesh, and other symptoms, and the absence of the intestinal affections attendant on herniæ, enable us to distinguish the nature of the complaint. If the surgeon should form a wrong judgment in such a case it cannot cause any serious consequences; the progress of the abscess will speedily set him right.

Varicous femoral vein.—A varicous state of the femoral vein may be the more readily mistaken for a rupture, since it admits of being reduced by pressure, increases by coughing, exertion, and the erect position, and is not perceived in the recumbent posture. In a case of this kind related by Sir A. COOPER,* where the swelling disappeared on lying down, pressure on the vein above the crural arch made it appear again. PETIT† has recorded an instance, which I insert here, as these cases are rare.

CASE.—“Being at Courtray, in Flanders, I was informed by my hostess, that her maid-servant had in the groin a tumour about the size of a hen’s egg. It produced no inconvenience while she continued at rest, and disappeared spontaneously in bed: it came down again when she rose, and gradually increased to its ordinary volume. A sense of heaviness and pain was then perceived in the thigh, leg, and foot; and obliged her to take occasional rest. An itinerant charlatan, conceiving the tumour to be a hernia, supplied the patient with a bad truss, at a very dear rate. This occasioned such pain in the thigh and leg, that it could not be worn for an hour together. The doctor advised her to wear it only in the night; when its application was not attended with pain. I found this young woman in a state of great suffering, although the truss had been laid aside

* Part ii. p. 9.

† Tr. des mal. chir. tom. ii. p. 299.

for two days. The colour of the tumour was rather brown ; it could be returned with facility, and the skin then resumed its ordinary appearance ; which convinced me that the peculiarity of colour arose from the contents. On continuing the examination, a swelling of the same colour appeared along the thigh, and a kind of cord could be felt by tracing the course of the saphena. Several large varices were found at the knee ; and others, in greater number and size, about the malleolus internus. I was now fully persuaded, that the supposed rupture in the groin was a dilated state of the saphena, which, as I know, empties itself into the crural vein near the passage of the latter under the arch of the abdominal muscles, and in the situation of crural herniæ."

The case of a female with a varicous enlargement of the femoral vein, which had been treated as a rupture, is recorded in the *Gazette Médicale* ; Dec. 1836. The patient, aged 69, came to the Hôtel Dieu to procure a new truss, the old one, which had been worn constantly for two years without any inconvenience, having become unserviceable. In the horizontal position, there is neither swelling nor any other unnatural appearance in the bend of the thigh. When the patient coughs, a rustling sensation (*bruissement*) is communicated to the fingers, and the integuments are raised ; the effect being closely analogous to the impulse felt in a rupture on coughing. When the patient is erect, and more particularly after walking, there is a tumour at the upper part of the thigh as large as a pigeon's egg, elastic, compressible, and easily reduced. Its surface presents inequalities, and the skin has a slight violet tint : an impulse is felt in it on coughing. The internal saphena and its branches are varicous both in the leg and thigh.

"I have seen," says Mr. MACILWAIN, "a peculiar enlargement of the vena saphena at the point of its termination in the femoral vein, forming a sort of pouch, and mistaken by an experienced surgeon for femoral hernia. The case was sent to me for a truss, and the tumour felt so exactly like a small femoral hernia, that I should have applied one without exposing the parts, (the usual mode adopted with regard to females in the truss society, where daily practice renders ocular demonstration unnecessary,) had it not occurred to me that the tumour did not occupy the situation of the femoral aperture. The first thing which I observed on examining the parts, was that the small cuta-

neous veins were in an enlarged condition, minute inspection showing the thigh to be variously studded with little clusters of venous ramifications, and in tracing the vena saphena up the thigh, the nature of the tumours was sufficiently manifest." *

Tumours composed of watery cysts † and others of a more solid kind, have been observed about the situation of the crural arch. The history and symptoms would probably point out the nature of the case; and even if such a tumour were mistaken for a rupture, the error could hardly give rise to any practical ill consequence.

* *Surgical Observations*, p. 300.

† *Parisian Journal*, tom. i. p. 252; MONRO *on Crural Hernia*, p. 80.

CHAPTER XVI.

Treatment of the Femoral Rupture.

SECTION I.—REDUCIBLE FEMORAL HERNIA.

A REDUCIBLE femoral rupture may be retained by a truss of nearly the same shape with that which is employed in bubonocoele. The distance from the curve to the end of the pad should be rather less, on account of the different relative position of the aperture. Since the instrument rests in the bend of the thigh, where it must interfere with the motions of the limb, the pad should be as narrow, from above downwards, as is consistent with the objects of the application; and it should be continued nearly in the same straight line with the spring, instead of being turned downwards. The crural ring, from its structure and situation, is less affected by external pressure than the abdominal canal. An advantage will be derived from bending the under edge of the pad backwards; so that its convexity, instead of being placed vertically, shall be turned a little upwards.

Crural herniæ are radically cured by means of trusses less frequently than those of the inguinal kind. The sides of the aperture appear, from their structure, to be less capable of contraction, and they are certainly less susceptible of approximation from external pressure.

SECTION II.—STRANGULATED FEMORAL HERNIA.

The smallness of the opening, through which the parts descend, and of the tumour itself, have been noticed already. In consequence of the former circumstance, the incarcerated femoral rupture is distinguished beyond all others by the closeness of the stricture. In all the instances, where I have seen the operation, there has never been room to pass more than the edge of the nail under the stricture;* and frequently even this has been impracticable. I have constantly found the same state of parts in the dead subject, except in the remarkable case related above. In one instance, where the sac actually contained both intestine and omentum, I could not, after removing the protruded parts, force my fore-finger into the opening; and in another, where a complete fold of intestine had been engaged, the opening, after removing the gut, would not admit a full-sized bougie, without considerable pressure. These circumstances will lead us to expect, as we actually find to be the case, that the femoral hernia easily becomes strangulated; that the closeness of the stricture diminishes the chance of reduction by any means but the operation; and that the great pressure, which the parts experience, renders delay very dangerous.

It is necessary to insist more particularly on these points, because Mr. POTT has represented them in a directly opposite light: he states, that the femoral rupture seldom becomes strangulated; that the contents may generally be returned in the operation without any incision of the stricture, on account of the “large space between the os ilion and os pubis, and that that space is occupied principally by cellular membrane and fat.”† The anatomical inaccuracy of this representation is obvious: that the surgical inferences are equally incorrect, will soon be discovered by any one who operates on a few cases of strangulated femoral hernia. Mr. HEY has already noticed the incorrect repre-

* In a case of small crural enterocele, PELLETAN observes of the protruded intestines, “L’arcade crurale le serroit à un tel point, que je ne pouvois pas rencontrer le moindre espace pour introduire un instrument propre à inciser cette arcade: je n’y parvins qu’avec une grande difficulté,” &c. *Clinique Chirurgicale*, tom. iii. p. 459.

† *Works*, vol. ii. p. 138.

sensation given by POTT. "These declarations surprise me exceedingly, coming from the pen of an author, who wrote so much from his own experience, as I conceive Mr. POTT to have done. If we look at the skeleton, we shall undoubtedly see a considerable space between the os ilium and pubis; but if we take our ideas from a subject labouring under a strangulated femoral hernia, we shall rather wonder, from the smallness of the aperture, how a descent could have happened. I have now performed the operation for the femoral hernia fourteen times in the female, and twice in the male subject, and have always found great difficulty in introducing the smallest portion of my forefinger into the femoral ring, for the purpose of conducting the bubonocoele knife. Nay, this introduction I have twice found impracticable, and have been under the necessity of making use of a director. In no case, in which I have operated, did there appear the least probability of reducing the prolapsed parts, without previously enlarging the aperture."*

The opinion of Sir A. COOPER, as expressed in the second part of his work on hernia, coincides completely with that of Mr. HEY, and with my own experience on this point. He notices the comparative smallness of the crural rupture, and states, that he has found the means of reduction less frequently effectual in this than in the inguinal hernia; which he ascribes to two causes, viz. the unyielding nature of the parts, through which the hernia descends, and the smallness of the aperture, forming the mouth of the sac.† He adds, "that the delay of the operation, which he lamented and condemned, when speaking of inguinal hernia, is to be still more deprecated in the crural; for death very generally happens earlier in the latter disease than in the former." The relation of a case follows, in which death took place in twenty-one hours and a-half from the accession of the symptoms. In two others, at the end of forty hours the parts were so much altered that it was not thought proper to return them into the abdomen. After mentioning some other instances of the fatal effects of delay, Sir A. COOPER concludes by giving his opinion in the following terms. "So strongly am I impressed with this belief, that if I were myself the subject of crural hernia, I should only try the effect of tobacco clysters; and, if they did not succeed, would have the operation per-

* *Practical Obs.* p. 150.

† *Part ii.* p. 15.

formed in twelve hours from the accession of the symptoms." *

The pressure of the opening on the neck of the sac occasions a thickening and induration of this part; which is more frequent here than in the inguinal hernia, in consequence of the narrowness of the opening.

The taxis.—In our attempts to reduce a crural hernia by means of the hand, the pressure must be accommodated to the peculiar course in which the parts descend. The general observations, which have been already made, concerning the position of the patient, &c. will apply here. As the crural arch and the fascia of the thigh are so immediately concerned with this swelling, the precautions of bending the hip, turning the limb inwards, and carrying the knee over the opposite thigh, are particularly necessary, in order to relax these parts. The pressure must first be exerted downwards and backwards, to push the swelling off the surface of POUPART'S ligament; and if the parts recede under the application of the force in this direction, it should be continued upwards, in order to make them pass under the crural arch. It must be obvious, from the description of the course in which the rupture descends, that no advantage can be obtained by pushing the swelling upwards in the first instance. Let the practitioner remember, that the smallness of the mouth of the sac, and the consequent tightness of the stricture, diminish the chance of effecting a replacement of the rupture by means of the taxis; and consequently, that when the strangulation is completely formed, he should not waste much time in attempts of this description.

"It is well known," says DR. BRESCHET,† in describing the practice of DUPUYTREN, "that the operation for femoral hernia, when performed within twenty-four hours of the occurrence of strangulation, is almost always successful; that strangulated ruptures, especially of the crural kind, are seldom replaced by the taxis; that a delay of twelve or twenty-four hours, in the hope of accomplishing this reduction, may cause very serious changes in the state of the patient, giving rise to peritonitis, or the gangrene of the intestine, when the surgeon feels himself obliged to operate, although convinced that there is little chance of success."

The opinions and directions of MR. BELL are to the

* *Part ii.* p. 32.

† *Lib. cit.* p. 60.

same purport: "When symptoms announce the canal to be obstructed, and when we feel a small hard herniary tumour rising from under POUPART'S ligament; when we have failed to reduce that tumour by the taxis, aided by bleeding, large purgative clysters, and the relaxation or deliquium produced by the warm-bath, lose not a moment in performing the operation with the knife, for the danger is imminent."*

Crural hernia, however, is not invariably characterised by this rapidity of progress and urgent danger. I have operated successfully in many cases after strangulation had lasted several days; and SIR A. COOPER returned a rupture of this kind, in which the protrusion, having been covered and concealed by a glandular swelling, had not been recognised, on the tenth day of strangulation; the symptoms were immediately relieved, and the patient recovered.† In another case, he operated successfully eight days after the commencement of strangulation: it was a large hernia, in which the intestine was covered and protected by a mass of omentum.‡ He operated in a third case on the eighth day, and found the protruded parts in a condition by no means unfavourable.§ MR. CLEMENT|| performed the operation with success on a crural entero-epiplocele in a patient of seventy-seven, in whom the strangulation had existed seven days.

SECTION III.—THE OPERATION.

The operation for femoral hernia will be performed in the same manner as that for bubonocoele. The division of the integuments, beginning an inch above the crural ring, should run obliquely downwards and outwards. I prefer an incision in this direction to one which would cross the middle of the tumour, in compliance with the general practice; because it runs over that part of the ligament which I propose to divide, in order to set at liberty the strangulated parts; and thus we gain more room for exe-

* BELL, *Surgical Obs.* vol. i. p. 206.

† *Part ii.* ed. ii. p. 3.

‡ *Ibid.* p. 10.

§ *Ibid.* p. 27.

|| *Obs. in Surgery and Pathology*, p. 108.

cutting a part of the operation, which is rendered peculiarly difficult by the great depth at which the stricture is situated.

With the same object of gaining room, Sir A. COOPER* advises that two incisions should be made in the integuments, resembling the letter T reversed, and having their point of union in the middle of the tumour. The first of these passes perpendicularly over the upper half of the swelling, and is crossed at right angles by the second, which extends in a transverse direction. The angular flaps of the integuments, made by these incisions, are then to be dissected off on each side.

DUPUYTREN's external incision is crucial, or in the form of the reversed T. "The integuments are to be pinched into a fold corresponding to POUPART's ligament, and the surgeon, holding one end of this fold with his left hand, divides it in a course parallel to the femoral vessels, whatever the direction of the tumour may be. The upper end of this incision should be over the crural arch, or an inch, or an inch and a half higher. Each side of this wound is divided, so as to render it crucial, and the flaps are turned back."†

The structure and arrangement of the coverings, which invest the peritoneal sac, must be borne in mind by the surgeon in executing the second part of his operation, that of laying bare the hernial contents. I have many times seen considerable embarrassment arise from an ignorance of this structure, in consequence of which the division of the fascia propria has led the operator to suppose that he had penetrated the true sac, and exposed the intestine, while it was still covered by peritoneum. But the merely temporary confusion is not the worst consequence of such a mistake: it has been attended in one instance with a fatal termination. After cutting through the first and most superficial investment, a surgeon returned the hernial sac with its fascia propria unopened, into the abdomen. As a free dissection was required, in order to separate it sufficiently for this purpose, the surrounding parts were left in such a manner, as, in conjunction with the neck of the sac, to continue the strangulation, and consequently to cause the patient's death.‡

A similar occurrence is recorded by Mr. KEY, who

* *Part ii.* p. 15.

† Dr. BRESCHET, *lib. cit.* p. 169.

‡ COOPER, *part ii.* pl. vii. fig. iv.

“witnessed an operation for crural hernia, in which the operator attempted to return the tumour, having mistaken the sac for the intestine. Great force was used, and, at length, the tumour disappeared; but the symptoms of strangulation were not relieved; and, on a post-mortem examination, the sac, with its contents, was found doubled upon itself, and forced under the fascia transversalis.”*

The lymphatic glands, among which the femoral hernia is situated, are not only a source of difficulty in the diagnosis of the complaint, but often cause embarrassment in the operation. One or more of them may be enlarged, and situated in the course of the incision; the tumour, when laid bare, may present the appearance of a collection of indurated glands, and these may constitute much of the swelling, enveloping and concealing the comparatively small hernial tumour. If suppuration should have occurred in such glandular swellings, the difficulties are increased.

The rupture itself is often irregular and sacculated, divided into compartments by frena and septa. A protuberance of the peritoneal covering sometimes appears, in such cases, as a serous cyst, or hydatiform tumour. Occasionally an empty and collapsed sac is situated upon the more recent protrusion: or closed serous cysts may be found on the outside of the sac.

Lastly, the parts are sometimes included in a double sac. Mr. CHEVALIER† mentions two instances of this kind, “in which the sac containing the intestine was included within another sac, into which it had descended, so as completely to fill up the aperture, to which it firmly adhered.” DUPUYTREN‡ met with a similar case. “On opening the hernial sac, a spoonful of fluid escaped, and a substance resembling intestine presented itself. This was soon found to be another hernial sac contained within the former; it was opened with great care, when about the same quantity of fluid escaped, and a portion of omentum and of intestine were discovered.”

Particular caution is required in opening the sac, as this hernia never contains more than a small quantity of fluid;

* *Memoir*, p. 121.

† *Medico-Chirurgical Transactions*, vol. iv. p. 325.

‡ Dr. BRESCHET, in his *Considérations, &c. sur la Hernie Femorale*, p. 51. This work contains an interesting series of cases from the practice of M. DUPUYTREN.

and as the protruded part is frequently a portion of intestine, unaccompanied by omentum.

Incision of the stricture.—The direction of the incision for the removal of the stricture is a material point of consideration, from the important parts which so closely surround the neck of the sac. If the knife be directed upwards and outwards,* the epigastric artery is greatly endangered.† If we cut straight upwards, the spermatic cord is exposed to risk.‡ The latter source of danger does not, however, exist in female subjects, on whom the operation is performed in the great majority of instances. An incision of the most interior part of the stricture is free from all danger in the ordinary course of the vessels. But that variety, in which the obturatrix artery, arising from the epigastric, runs along the inner margin of the sac, seems to preclude us from cutting even in this direction. A mode of operation has been lately proposed with the view of avoiding this danger. We are directed to make an incision through the aponeurosis of the external oblique muscle, just above the crural arch, and in a direction parallel to that part: to introduce a director under the stricture from this opening, and to divide the tendon to the requisite extent by means of a curved knife passed along the groove.§

* In using the words *upwards and downwards*, I suppose the patient to be in the erect attitude.

† Division of the stricture upwards and outwards is recommended by RICHERAND and DUPUYTREN: the latter surgeon, who has often operated in this manner, both on males and females, has never met with any troublesome hemorrhage. He employs a curved probe-pointed bistoury, cutting on the convexity, and limits the incision to the small extent just necessary for the return of the parts. He finds the instrument just mentioned much more convenient than the bistoury of POTT, which embraces too great an extent of parts, and can only be made to act on the stricture by elevating the handle considerably, and carrying the blade in a curved line. The convex-edged bistoury is to be conducted flat on the palmar surface of the left fore-finger, carried in the same way under the stricture, and then turned up, when its cutting edge directly meets the part requiring division, and acts on it immediately and with precision. He carries the incision through the upper end of the falciform process, to the margin of the crural arch. BRESCHET, *Concours*, &c. p. 182, et suiv. and pl. iii. fig. ii.

‡ ARNAUD operated on a young man of twenty-two for crural hernia: he died in an hour after the operation, which had not been attended with any unusual bleeding. Division of the spermatic artery, and large effusion of blood into the abdomen, were found on examining the body. *Mém. de Chir.* tom. ii. p. 755.

§ *Edinburgh Med. and Surg. Journal*, vol. ii. p. 205. "The operation has been performed successfully in this way, in two cases, in the Royal Infirmary, by Mr. LAW." It seems that this mode of operating was first pro-

If this plan were perfectly executed, it would undoubtedly remove all risk of injuring any of those parts, which are more or less endangered in the other ways of relieving the stricture. But it supposes a too perfect and familiar acquaintance with the anatomy of the parts to admit of being practised by surgeons in general. The attachment of the fascia transversalis to the crural arch, and the close connexion of the hernial sac to the tendon in an old rupture must produce considerable difficulty. If the arteries run so near the crural arch as to be endangered by the other way of operating, there will be risk of wounding them in this method: particularly if the parts should be obscured by bleeding. Lastly, the contents of the swelling would be inevitably exposed to danger, as the extreme closeness of the stricture does not admit of interposing anything to guard them.

I consider the best and safest method of executing this part of the operation to be that of dividing the thin posterior border of the crural arch near to its insertion in the pubes. This is the very part which constitutes the stricture, and where a smaller division will accomplish our object than in any other situation. Yet half an inch in all cases, and in many instances a longer space may be gained in this quarter, without affecting the main insertion of the ligament into the spine of the bone. The crural arch, therefore, is less weakened by a division of this than of any other part.

Strong testimony in support of these points may be derived from the advice of RICHTER, who recommends an incision in the same portion of the arch, without knowing the anatomical reason on which its propriety is grounded. The following passage shows his opinion on this subject; “ Je conseille en même tems de faire l’incision le plus près possible de l’angle interne de l’arcade, non seulement parcequ’on est plus éloigné de l’artère épigastrique; mais parceque la hernie passe principalement par cet endroit, *et qu’on obtient beaucoup plus d’espace lorsqu’on élargit cet angle.*” *

posed by Mr. ELSE of St. Thomas’s Hospital; COOPER, part ii. p. 17; Dr. HULL attempted it, but he could not succeed in passing a director under the stricture from above. Case of ELLEN LIVESSEY in *Med. and Phys. Jour.* vol. xi. p. 120; Mr. BORRETT found great difficulty in accomplishing it; COOPER, part ii. p. 18.

* *Tr. des Hernies*, p. 249. Or in his *Anfangsgründe der Wundarzneykunst*, vol. v. p. 449.

Mr. HEY has candidly stated, that he had from experience gained a knowledge of the proper manner of performing the operation, before he had acquired from anatomical investigation a just idea of the part, which principally causes the strangulation. He adds, that he had often wondered, that so small a division of *the most interior part of the stricture* should be sufficient for reduction.

If it should be practicable to guide the blunt-edged knife with the tip of the finger or of the nail under the edge of the tendon, the fibres should be carefully divided in succession, until we have gained just sufficient room to replace the contents of the swelling.* When, as is generally the case, the tightness of the stricture prevents the operator from using his finger as a guide, he will employ the deeply-grooved curved director, introducing it as near as he can to the pubes. In both cases the blunt end only of the curved knife should be passed beyond the stricture, that the division may be effected without risk to the arteries, in case they should not follow their usual course. The intestine should be protected by the operator's left fore-finger, while he is using the right hand in cutting the tendon; and if both his hands are employed, it may be held aside by an assistant; for the depth at which the stricture is situated from the surface, and the narrowness of the opening, occasion some danger of injury to this part, and this risk is considerably increased when the intestinal coats are weakened by ulceration, as described at the end of the chapter.

In this mode of operating we shall entirely avoid the spermatic cord, and the epigastric artery in the ordinary course of the vessel. It must be allowed, that in the less frequent distribution, which has been described above, the obturatrix artery will be endangered. The risk is not sufficient to induce us to exchange this for any other method, that has been hitherto proposed; as I know of none, which avoids the vessel more certainly, while in facility of execution, and in other advantages, this has the undoubted preference.

A calculation of the proportionate number of instances,

* The way in which GIMBERNAT executes this part of the operation has always appeared to me to be very awkward and objectionable. He employs a director and curved knife, holding each of these in one hand, and then moves them both together along the surface of the bone. Page 45 and 46.

in which we may expect to find the obturatrix artery running along the inner side of the neck of the sac, will much diminish our apprehensions concerning the danger of this vessel. The obturatrix artery arises from the trunk of the epigastric once in between three and four times. Yet where the origin of the vessel thus deviates from its accustomed place, it generally takes its course along the outside of the hernial sac, and consequently is exposed to no danger.* That the other arrangement, in which the obturatrix artery is found on the inner side of the mouth of the sac, is rare, is proved by the statements in the note at p. 482. The comparative number of such instances cannot be stated higher than one in twenty. If, therefore, we admit that the obturatrix artery arises from the epigastric once in four times, it would be endangered only once in eighty operations. And, if we consider, that by the precaution of introducing the knife to the very smallest distance within the stricture, that is compatible with effecting the cut, by the careful successive division of the tendinous fasciculi, and by carrying this division only just so far as to gain the necessary room for reduction, the artery may frequently escape; the probability of any unpleasant occurrence is so much diminished, that it hardly constitutes an objection, and certainly would not justify us in leaving this method for any but one that should be perfectly free from all danger.

All the evidence that I have been able to collect on this subject, concurs in demonstrating the safety of the above-mentioned mode of operating.

CASE.——— JOINS, a poor woman of the parish of Ampney, near Cirencester, about fifty years of age, had laboured under a strangulated femoral hernia for six † days,

* “In all cases (says Sir A. COOPER) which I have myself dissected, where this variety existed with crural hernia, the obturator has passed into the pelvis on the outer side of the neck of the sac, entirely out of the reach of any danger of the knife.” Part ii. p. 21.

There are two specimens of double femoral hernia in the Museum of St. BARTHOLOMEW'S Hospital, with the obturatrix artery arising from the epigastric on each side. The former vessel runs on the outer side of the neck of the sac in one of these four ruptures, and on the inner side in the other three.

† This case does not correspond with the representations already given concerning the urgent nature of the symptoms, and the rapid progress of crural herniæ. The circumstances sufficiently account for this deviation from the usual course. It must be remembered, that the intestine was pro-

in which time all the usual remedies had been unsuccessfully employed. On performing the operation, a piece of omentum and a small bit of intestine were found to have passed under POUPART's ligament. Both these parts were of a deep red, and almost brown colour. I removed the omentum; and the divided edge did not afford the slightest hemorrhage. The stricture, which was deeply seated, was manifestly formed by the thin posterior border of the crural arch. I divided it in the situation which I have recommended above, by conveying the probe-pointed bistoury in the groove of a director. The parts were now returned with ease, and the patient soon recovered. I have operated in the same way in numerous instances with equal success; and I have seen the same method employed by others without any unfavourable occurrence.

GIMBERNAT has operated in this manner in four* instances: and Mr. HEY† employed a nearly similar method with advantage in a much greater number of cases. Sir A. COOPER's mode of operating, which must stand on exactly the same ground with that which I have recommended, as to the danger of wounding arteries, &c., has never been attended with any unpleasant consequence in the numerous instances in which he has practised it.

GIMBERNAT's operation has been objected to by Sir A. COOPER, who recommends a different method of removing the stricture. On account of the depth, at which the posterior margin of the crural arch is situated, and the closeness with which the protruded viscera are embraced by the tendon, he states that the intestine is greatly endangered: that it may easily get before the edge of the knife; or, if it be held aside sufficiently, it is exposed to the danger of laceration. He relates two cases, in which accidents of this kind have actually occurred, and caused a fatal termination. He is therefore in the habit of dividing the stricture on its anterior part, as far as the front margin of the crural arch, directing the edge of the knife upwards and inwards. If this is not sufficient, he afterwards divides

tected from pressure by a mass of omentum; and the age of the patient must also be taken into the account.

In an instance, recorded by Sir A. COOPER, the operation was successfully performed on the eighth day; there also a large portion of omentum was protruded with the gut. Part ii. p. 24.

* P. 28 and 29.

† P. 150 et seq.

the thin posterior border of the tendon, still carrying the knife in the same course. In the male subject he makes a small transverse incision above POUPART'S ligament, and draws the spermatic cord out of the reach of the knife by means of a bent probe. His own description of the proceeding follows.

“ The finger is to be introduced gently into the sac, and the omentum and intestine separated from its anterior part, the probe-pointed bistoury which I have recommended, which does not cut near its point, is to be pushed into the crural sheath at the anterior part of the sac, and the sheath is to be cut as far as the anterior edge of the crural arch, or POUPART'S ligament. In a small hernia, this division, which does not exceed half-an-inch, will be sufficient for the reduction of the parts.” “ But when the sheath has been thus divided, if the intestine, when slightly compressed, cannot readily be emptied, the finger must be passed at least half-an-inch higher, and then the posterior edge of the crural arch and the fascia transversalis will be felt, forming a sharp edge, strongly compressing the mouth of the hernial sac. To divide this edge, the knife must be carried within the stricture, and being inclined obliquely inwards and upwards, at right angles with the crural arch, a cut may be very safely made in that direction sufficient for the purpose of liberating the intestine from pressure.” “ In the female, if the hernia is large, it will be sometimes, though very rarely, necessary to cut through the anterior edge of the crural arch or POUPART'S ligament, and this may be done from the inner side of the hernial sac by cutting obliquely upwards towards the umbilicus. But in a large hernia in the male subject, when the division of the crural arch is required, a different operation becomes necessary to prevent the spermatic cord from being injured. When the parts have been laid bare, and are found to be too large to be liberated by the division of the sheath and posterior edge of the crural arch, an incision should be made through the tendon of the external oblique muscle over the mouth of the hernial sac, about a quarter of an inch above the crural arch, which will expose the spermatic cord. This being drawn up by the finger, or by a curved probe, and removed from the direction of the incision, the surgeon carries his finger into the sac with the bistoury upon it, and the anterior edge of the crural arch is cut without the smallest risk to the spermatic cord.*

* *Part ii., edit. 2 ; p. 13—15.*

It would be necessary to operate several times in both ways in order to form an opinion on the comparative merits of this proposal and that which I have already recommended. The thin edge of the crural arch has always appeared to me to be so materially concerned in forming the stricture; and it is so clear that a division of the part in question affords much more room than that of any other, that I consider this method as meriting the preference.

It must be acknowledged, that the tightness of the stricture, and its depth from the surface, are serious difficulties in performing this operation. If, therefore, sufficient room could be gained by dividing the parts between the mouth of the sac and the crural arch, on the anterior part of the rupture, in the way recommended by Sir A. COOPER, that method would be preferable. And when we consider that the falciform process is folded in at this part, and connected to the thin border of the arch, there can be no doubt that the stricture would be relieved to a certain degree. I would therefore advise this plan, with caution not to extend the cut through the arch; and if sufficient room were not gained, the process recommended above may be followed. In all the cases in which I have operated, a division of the posterior thin edge of the crural arch has been necessary.

Wounds of the epigastric artery.—In operating on a female for strangulated femoral hernia, Professor BENEDICT of Breslaw divided the epigastric artery which ran across the neck of the sac. He employs, in the femoral hernia of females and in all inguinal ruptures, a mode of dividing the stricture which has the advantage of enabling the operator to discover the source of any bleeding that may occur. That is, he introduces a winged probe into the neck of the sac, and cuts from without inwards, and from below upwards. When, in this case, the wounded epigastric artery bled, which it did freely, the assistant immediately seized the mouth of the vessel, and it was easily tied.*

After the division of the stricture, in a case of strangulated femoral hernia in the female, on which I operated, a profuse arterial hemorrhage took place. The blood came from such a depth, and filled the wound so rapidly, that the source of the bleeding could not be discovered. The patient became faint; a compress and bandage were applied, and the bleeding ceased.

* RUST. *Magazin für die gesammte Heilkunde*, vol. xliv. p. 178.

A case, in which the epigastric artery was probably divided, and the bleeding ceased spontaneously, is mentioned at p. 272.

The protruded intestine is often found to have undergone serious injury from the pressure of the stricture, as mentioned at p. 55. The smallness of the aperture, and the sharp, almost cutting edge of POUPART'S ligament, which forms its inner boundary, enable us to understand why this effect of strangulation, without being confined to cases of femoral rupture,* should be much more frequent in them than in other species of the complaint. The state of the intestine will vary, according to the degree of pressure and the time it has existed. The bowel may be simply constricted, as if it had been tied firmly, without any division of its tunics. DR. MONRO mentions a case in which the intestine was of a deep purple colour, but not gangrenous; and it did not tear, though handled rudely. The stricture upon the intestine was so great that even air would not pass it. When removed from the body and preserved in spirits, an intestine thus altered is permanently constricted; but if it be pressed, handled, and gently extended, the natural dimensions are restored. With contraction, there may be an obvious thinning of the strictured part, from ulceration of the internal and muscular coats; when this has gone to its greatest extent, the serous membrane alone, which resists the longest, remains entire. Often this ulceration and thinning are confined to the internal side, opposite to the sharp edge of GIMBERNAT'S ligament. The intestine first descends along the side of the femoral vein, and then suddenly turns forwards and upwards, so that it must be forcibly pressed directly against this part of the crural arch. Lastly, the serous membrane itself may have ulcerated, producing a small pin-hole, or a larger aperture into the intestinal tube, usually attended with a fetid fecal smell on laying open the sac. This had occurred in the case related at p. 349.

* Several examples have been preserved by MR. STANLEY in the museum of St. BARTHOLOMEW'S Hospital: these specimens have been taken, partly from femoral, partly from umbilical herniæ. MR. SWAN has observed the same occurrence in a congenital case. In examining the body, forty-eight hours after the operation, he found the intestine retaining the most distinct mark of the stricture, and "the bowel (ileum) was so changed at this part as not to be capable of admitting the point of the little finger."—*Edinb. Med. Surg. Journal*, vol. xxi. p. 297.

† *Morbid Anatomy of the Gullet*, p. 393.

In a patient, who had laboured under strangulated femoral hernia for seven days, and died a few hours after the operation, Mr. CHEVALIER† found that “the protruded intestine had given way for nearly half its circumference, on that side which lay next the symphysis pubis, and from the aperture thus formed the feces had escaped into the abdomen. No gangrene, however, had taken place, but the opening appeared as if the intestine had been cut to that extent by a pair of blunt scissars.”

In a case of femoral hernia, which had become strangulated on the 20th of October, M. GOYRAND, of Aix, operated on the 2nd of November. The sac contained a small quantity of yellow intestinal matter; a portion of omentum, and of intestine. The latter was reddish, and presented a small perforation on its external side. After Mr. G. had removed the stricture he endeavoured to draw the bowel downwards, when he found the coats completely divided opposite to the falciform fold of the fascia lata. He left it in the wound, and a copious discharge of liquid and gaseous matters followed. The patient died in a few hours, and was not examined.*

If the constriction should have been circular, so as to intercept or at least interrupt the circulation of the part, and that for some days, the included portion may mortify. In a case of femoral hernia, operated on by DUPUYTREN, the protrusion consisted of a portion only of the diameter, about an inch long, and half an inch wide, which was found of a livid violet colour, and went in spontaneously, after the stricture had been removed. The patient died in forty-six hours, when the intestine was found adherent to the posterior surface of the crural arch, and to the mouth of the sac, “about two-thirds of its calibre had been constricted, the other third remaining free. But the latter must have been intercepted by the prominence, or septum, formed at the junction of the two ends of the strangulated portion. This prominence must have been more considerable at the time of strangulation, because the two ends then formed a more acute angle: hence probably the interruption to the passage of feces and air. The circular impression left by the stricture was blackish, and very narrow (linéaire:) the portion, which it circumscribed, was marbled, violet coloured, and covered by a slight glutinous

* *Medico-Chirurgical Transactions*, vol. iv. p. 324.

† *La Presse Médicale*; March, 1837.

stratum. Towards the centre was a white round spot, a slough, occupying the whole thickness of the bowel; separation had not yet commenced, but as this slough was opposite to the mouth of the sac, and the rest of the bowel adhered to the neighbouring parts, if the patient had lived, no effusion would have taken place into the abdomen, on the detachment of the mortified part.”*

The intestine, in these cases, is usually unadherent, and its general state and appearance are by no means unfavourable.

The nature and effect of the injurious influence which the bowel experiences from the pressure of the stricture, and the fatal disturbance which the return of a part thus injured is capable of exciting in the cavity of the abdomen, are well illustrated in the two following cases.

CASE.—ELIZABETH TOMLINE, aged forty-three, came under my care in St. BARTHOLOMEW’S Hospital, on the 3rd of December, 1827. She had been subject for some years to a swelling in the right groin, which had been always easily reducible, and had occasioned no inconvenience, so that she had never worn a truss. On Wednesday, Nov. 28, while standing at the washing-tub, she felt a sudden increase of the tumour, accompanied with pain: she immediately went to bed, but was unable to return the parts. Pain increased in the evening, and vomiting came on: she took aperient medicine, which produced no effect. The vomiting and constipation have continued to the present time; but she represents that the pain and tenderness of the tumour and abdomen were more severe two days ago than at present. On her admission into the hospital there was a tumour, about the size of a large walnut, in the right groin. It was rather tense and elastic, but not very painful. The abdomen was generally swelled, nearly free from tension, and slightly painful on pressure. The pulse was frequent, but not full nor hard. She was immediately placed in a warm-bath; opening medicine was given, and an enema administered: the former was rejected, and the latter returned without fecal matter. I saw the patient soon after her admission; and, as it was the fifth day of strangulation, proceeded to operate at 11 p. m. A small quantity of light coloured serum escaped on laying open the hernial sac, and a portion of small intestine was exposed, of the deepest brown colour, nearly approaching to black. This was so

* BRESCHET, lib. cit. obs. ii.

closely strictured, that it was impossible to introduce even the end of a small probe on the anterior or inner side of the bowel. The director, therefore, was with some difficulty passed on the outer side, and the stricture enlarged by carrying the curved knife obliquely upwards and inwards, when the bowel was easily replaced. The integuments were united by three sutures. Two hours after the operation, she took a dram of Epsom salt in a saline draught, with directions for its repetition every hour till the bowels should be opened. Dec. 4; two o'clock, A.M. The bowels have been opened two or three times; the pulse has become quick and sharp; the abdomen painful. Venesection to fourteen ounces. About an hour afterwards considerable hemorrhage took place from the wound, so that it was necessary to remove the sutures, and secure two or three vessels. Eleven P.M. She has slept at intervals; the bowels have been freely evacuated, with much relief. Complains of great pain in the vicinity of the wound and in the abdomen, which is swollen and very tender; pulse hard and sharp; the blood taken in the morning is not inflamed. (Venesection to twelve ounces. Fifty leeches to the abdomen, followed by warm fomentations and bread poultice. The medicine continued every four hours.) In the afternoon, the countenance had undergone a marked change; the swelling and pain of the abdomen were increased, vomiting had come on; the pulse was quick and feeble. A clyster was administered, as the bowels had not been open since the morning. The pulse became more feeble, and the body was covered by cold perspiration: she suffered extreme pain, became delirious, and died at eleven P. M.

Examination, fourteen hours after death.—The abdomen was nearly filled with numerous convolutions of distended small intestine, streaked with red at the points of contact, and slightly agglutinated to each other as well as to the parietes. This was the portion of the canal above the protrusion, which had consisted of ileum, about four inches from the cæcum. The returned bowel was about two inches in length, and agglutinated to the surrounding convolutions and the abdominal parietes; the inflammation was most considerable at this point, and extended thence over the cavity. It exhibited the same discoloration as when exposed in the operation, but had not lost its vitality. The discoloured portion was bounded by a circular indentation, as if it had been tightly embraced by a cord, and

this contraction was not removed by powerful inflation. The impression was deepest where the bowel had lain under GIMBERNAT's ligament, the sharp edge of which had left a crescent-shaped white mark on the peritoneal surface. The mucous membrane was ulcerated in a narrow line corresponding to this mark. The intestine was highly inflamed for some inches above the part which had been protruded.

This case exemplifies both the local and more general effects, which the stricture is capable of producing in cases of strangulated rupture. The bowel had suffered serious mechanical injury at the strictured part ; and the coats of the protruded portion had undergone so considerable a change in consequence of this pressure, that they were incapable of recovery. Until the time of the operation, the symptoms were nearly such as might be occasioned by mere mechanical obstruction ; that is, constipation, general enlargement of the abdomen without tension or pain, and disturbance of the stomach. Soon after the operation, symptoms of peritoneal inflammation appeared, namely, severe pain and tension, constant sickness, disturbed circulation : there can be no doubt that this inflammation was excited and maintained by the presence in the abdomen of the altered portion of the bowel. The symptoms were indeed mitigated by the occurrence of stools and by the loss of blood ; but they returned quickly in each instance, and soon destroyed the patient.

It is worthy of remark, that, although the intestine had suffered so much from the stricture, the general character of the case, before the operation, both in the degree of the symptoms and the rate of their progress, was decidedly chronic. This should teach us that the apparent mildness of the symptoms is no reason for deferring the operation, whenever we are satisfied that strangulation exists.

Shortly before this case occurred, I operated on a similar one of strangulated femoral enterocele. The sac contained a small portion of gut, nearly black : copious evacuations followed the operation, but the patient gradually sank under symptoms of peritonitis. On opening the body, I found the gut just as much discoloured as when it was replaced. Violent inflammation appeared in the neighbouring peritoneal surfaces, and it extended in a less degree over the cavity. When the gut was taken out and inflated, it was deeply constricted, and reduced to one-third of its

natural diameter at the point of strangulation. The indentation was most remarkable opposite to the edge of GIMBERNAT'S ligament, and the mucous membrane exhibited at the corresponding part a long linear ulceration.

In the following case, operated on by Mr. ARNOTT, the mucous membrane had become ulcerated, and the effect of pressure on the bowel probably led to the patient's death, although the strangulation was not of long standing, and the symptoms had not been violent or alarming. A female, twenty-five years of age, had been subject for five years to a femoral hernia of the left side, and had occasionally worn a truss, but not recently. It came down in consequence of an exertion on the 29th of April, when she experienced pain in the stomach, nausea, and vomiting. She was visited in the evening by a surgeon, who thought that he had returned the rupture: she was tolerably easy on the following day, and was free from sickness, but vomiting returned in the evening. On the following morning the surgeon, having found the rupture still down, bled her to twenty ounces, but could not return it. She was therefore sent to the Middlesex Hospital. At this time the tumour was the size of a small walnut, smooth, tense, and without pain; but there was some tenderness of the abdomen on pressure; Her countenance did not indicate suffering or anxiety; she was not sick, and had not vomited some hours; she had had no motion since the morning of the 29th; the pulse was feeble, and she was chilly. The taxis, the warm-bath, and a clyster, having been tried unsuccessfully, the operation was performed without further delay. Some brown-coloured serous fluid was discharged on opening the sac, which contained a knot of intestine, the size of a hazel-nut, dark-red, and smooth. It was easily returned into the abdomen, when the stricture, which was very tight, had been relieved by a small incision, and its reduction was followed by the escape of a considerable quantity of serous fluid from the cavity. She died on the 3rd, without having had the bowels relieved, having experienced considerable pain of the abdomen, for which free leeching and venesection had been resorted to, and having taken various aperient medicines. On examining the body the next day it was found that there had been a considerable discharge after death of serous fluid from the groin. The abdomen contained a small quantity of sero-purulent effusion. The intestinal convolutions were not adherent. The portion of bowel

which had been strangulated had receded to the distance of three or four inches from the crural ring: it was dark-red, and smooth, and presented an appearance of stricture; but the peritoneal coat was entire. On slitting up the discoloured portion, which was not gangrenous but rather thinner than the rest of the bowel, the mucous membrane presented a breach of surface at the part which had been constricted, transverse as regarded the course of the bowel, and, with the exception of the portion where the mesentery is attached, the ulceration involved the whole circumference of the canal. The breach of surface was filled by firm yellow coagulable lymph. The intestine was greatly distended above the strangulated part, and the peritoneal covering presented longitudinal streaks formed by minute vessels.*

The pressure of the stricture may cause inflammation of the intestinal tunics generally, with effusion of lymph both on the serous and mucous surfaces. In a strangulated intestinal crural rupture, mentioned and delineated by Dr. MONRO, the protruded gut was connected to the sac by a layer of lymph; its cavity was nearly filled by the same substance, and there was so complete an obstruction at the strictured part that not even a small probe could be passed from the upper to the under part of the strangulated intestine.†

We have no data for determining exactly what time is necessary for producing the changes just described. That the injury to the part will be greater, the longer the compression lasts, is obvious; and this is another argument for an early performance of the operation. In an umbilical hernia, which I lately operated on, in six hours from the descent of the intestine, and where the constriction was so close, that the grooved director passed in with great difficulty, the protruded convolution of intestine was separated from the neighbouring part by a manifest circular constriction at each end, and was, throughout, of the deepest livid hue, apparently from the intercepted circulation. The patient died in forty-six hours. The bowel, which had been protruded, had partially lost its lividity, but the circular marks of the constriction were still visible: and ulceration of the mucous membrane had commenced at one point.

* *London Medical Gazette*, vol. x. p. 269.

† *Morbid Anatomy of the Gullet*, p. 498, 9, pl. xiv. fig. 2.

The generally favourable appearance of the intestine leads the surgeon, in these cases, almost without reflection, to return it into the abdomen. But the consequences of such conduct are not uncommonly fatal. The ulceration of the coats continues, the tube is penetrated, its contents escape into the cavity, and death speedily follows.

What course, then, ought to be pursued in such cases? Should we return the bowel, or leave it on the outside, in the wound, until the risk of its giving way shall have passed by? If the intestine should exhibit merely an impression from the stricture, and we are able, by careful examination, to ascertain that the coats are uninjured, or at least not visibly thinned by ulceration, the part ought unquestionably to be replaced; the natural diameter being first restored by carefully extending the constricted portion.

Instances are recorded, in which the bowel has been replaced, although nearly opened by the ulcerative process, and the patients have recovered. DUPUYTREN operated on a female, twenty-six years old, and found a portion of intestine three inches long protruded at the crural ring. It was reddish, or chesnut-coloured, and connected to the sac by recent adhesions. When the stricture had been removed, and a portion of the sound intestine drawn out, a whitish transparent mark, about two lines in breadth, was observed at the strangulated part; the intestine was here thinned, and seemed reduced to its peritoneal coat. It was replaced; and the patient recovered.* In another case† he pursued the same practice with an equally favourable result, where “the intestine presented a rupture (*érraillement*) of the internal and middle membranes, three or four lines in extent. The serous membrane alone was left. Did the pressure of the crural arch on the intestine produce this rupture, as a ligature divides the internal coats of an artery? Are we warranted in reasoning from analogy on the effects produced in tissues, which differ so widely in structure and properties?”

In two cases of femoral hernia M. VELPEAU returned the bowel, although it was actually perforated by ulceration. The result was favourable; a circumstance which we can explain by the adhesions that would form between the affected intestine and the neighbouring serous surfaces, with the effect of preventing the escape of the intestinal

* DR. BRESCHET; lib. cit. obs. 30.

† *Ibid.* obs. 16.

contents. One of these was a female of fifty-five, with a crural hernia, which had been strangulated four days. M. VELPEAU found in the sac a convolution of small intestine, of a suspicious livid tint, but not mortified. Having drawn out the bowel to examine it more carefully, after the stricture had been divided, it was found penetrated by ulceration at three points, two or three lines distant from each other on the convexity of the fold. It was observed that these openings diminished in consequence of the intestine being emptied, and it was consequently determined to return it into the abdomen. The wound was kept open. There was no escape of fecal matter, nor any other unfavourable symptom: and cicatrization was completed at the end of a month. In another female, of forty-seven, operated on after twenty-four hours of strangulation, the intestine received a wound eight lines in length from the knife, in consequence of a sudden movement of the patient. The cut was on the convexity of the intestine, and parallel to its course, and gave issue first to a darkish mucous fluid, and then to a yellow frothy matter. The result of the former case encouraged M. VELPEAU to return the wounded bowel in this instance. The vomiting and the other symptoms ceased after the operation; natural stools occurred on the following day; and the patient left the hospital perfectly cured on the thirty-fifth day.*

To these fortunate cases we might oppose many instances of opposite results; of perforated intestine, fecal effusion, and death. Let the operator then observe the rule of gently drawing out the bowel, after liberating it from stricture, so as to ascertain its state, particularly on the inner side of the constricted portion, opposite to GIMBERNAT'S ligament. If he see no reason to apprehend perforation of the tube, he will replace the intestine in the usual manner; on the contrary, should this point appear doubtful to him, let him leave the part on the outside, rather than expose the patient to the irremediable danger of effusion into the abdomen.

A minute aperture in the bowel, if unattended with other mischief, might be closed by a fine silk ligature, according to the method described at p. 301. This course of proceeding might possibly have saved life in a case operated on by Sir A. COOPER. Feces escaped from the wound just as he had pushed up the last portion of bowel. Severe

* *Journal Hebdomadaire*, Juillet, 1836.

pain of the abdomen, with extreme restlessness, came on speedily, and death ensued in four hours and a half after the operation. Sir ASTLEY says, "on examining the body I found the feces effused into the cavity of the abdomen, the intestine universally inflamed, the portion of gut, which had been strangulated, but little altered in colour, but with a hole in it opposite to the stricture. Whether in this case the intestine gave way at the strictured part by drawing it aside, or was injured by the knife, it is impossible to determine."*

Introduction of the finger to ascertain that the protruded parts have re-entered the abdomen.—When the protruded parts have been returned, the end of the finger should be introduced gently into the wound to ascertain that they have re-entered the abdomen, and that the neck of the sac is free. If the latter part should be the seat of stricture, the contracted portion of membrane may escape division, and the parts may be pushed out of sight, although still constricted; they may pass between the peritoneum and the crural arch, detaching the membrane more or less extensively in that region, where it is connected by a loose cellular tissue. The possibility of such an occurrence is shown by the cases already mentioned in this section, of femoral ruptures returned with the sac unopened in consequence of the fascia propria having been mistaken for intestine, and its contents still constricted by the neck. See *ante*, p. 504.

Mr. KEY has recorded, in the second edition of Sir A. COOPER'S work, a case of femoral hernia, in which the sac was opened, and the parts were returned, but not satisfactorily. They were found after death still strangulated by the neck of the sac, which had not been divided.†

Sir CHARLES BELL operated in the Middlesex Hospital on a female with femoral hernia, which, having been kept up with a truss for two years, had come down suddenly from an unusual exertion, and become immediately strangulated. "Nothing particular occurred in the first steps of the operation: the stricture was very small, so that a great deal of care was requisite. The sac was opened, when some fluid escaped. The precaution was now taken to draw down a large portion of intestine, for the purpose of relieving, as it were, the strangulated knuckle. The

* Part ii. ed. 2, p. 28.

† Part ii. pp. 11 and 12, Note.

crescentic arch was divided, and the tumour returned. Upon examination it was found, however, that instead of being within, it was without the cavity of the peritoneum, so that it was necessary to draw the intestine back through the opening. The finger was now inserted, and the neck of the sac was found grasping the intestine firmly. After some trouble this was divided, and the mass returned."†

An occurrence of similar nature came under my observation in examining, after death, the body of a man on whom the operation for crural hernia had been performed unsuccessfully. When the abdomen was laid open, the peritoneum at the crural arch was raised and distended by a considerable tumour placed between it and the abdominal muscles. The omentum was continued into a round opening with smooth sides at the centre of the swelling. The latter consisted of a large mass of omentum, adhering partially to the hernial sac, and placed between the abdominal muscles and peritoneum, of which the cellular connexions had given way so as to admit of the membrane being detached to a considerable extent. The hernial sac had been laid open, but its neck was not divided; and this constituted the round opening in the middle of the tumour. When the narrowness of the stricture in crural hernia is considered, it seems difficult to understand how so considerable a bulk of parts could be returned: but further examination removed this difficulty. The crural arch had been completely detached from the pubes, so that the incision extended from the crural into the lower abdominal ring. Fortunately, the spermatic cord was not injured.

SECTION IV.—OPERATION ON STRANGULATED FEMORAL HERNIA WITHOUT OPENING THE SAC.

Although this proceeding might seem at first view less applicable to femoral than to inguinal or umbilical ruptures, on account of the small opening through which the parts are protruded in the former instance, and the close manner in which they are confined by the stric-

* *London Medical Gazette*, vol. xiii. p. 605.

ture, it has been employed in several instances without any particular difficulty, and with successful results.

The first case of those recorded by DR. MONRO was a femoral hernia, strangulated for three days, in a patient thirty-five years of age. At the suggestion of the doctor, MR. WOOD cut the tendon without opening the sac, and the contents of the swelling were then returned with ease. This occurred in 1770.

In 1782 the same course was pursued under Dr. MONRO's direction in a strangulated femoral rupture; but the parts were still confined by thickening of the neck of the sac. A small opening was then made in the peritoneum above the stricture, to allow the introduction of a bent probe, on which the neck of the sac was divided. The intestine was then easily reduced, and the patient recovered.

In his "*Memoir on the Advantages and Practicability of Dividing the Stricture in Strangulated Hernia on the outside of the Sac,*" MR. KEY has related three cases of femoral hernia successfully operated on in this manner. In the first instance, that of a man forty-four years of age, the operation was performed in about twenty-four hours from the occurrence of strangulation. "The usual incisions having laid bare the fascia propria of the tumour, I made a small opening in it sufficient to introduce a director up to the seat of stricture, under POUPART's ligament. As soon as the director reached the neck of the tumour its progress was impeded; but, by pressing the point downwards, it readily passed under the stricture, which was divided by a bistoury carried along its groove. Passing the edge of the knife under the stricture was sufficient to release the bowel; very moderate pressure being made on the swelling, the bowel could be immediately felt to slip back into the abdominal cavity; scarcely any blood was lost during the operation."

The second case was that of a female patient, sixty years of age, operated on a few hours after strangulation had occurred. MR. KEY says, "I exposed, by means of a crucial incision, the fascia propria of the tumour, and, making an opening into it, so as to expose the fatty investment of the sac, I endeavoured to pass the director towards the stricture; but, owing to the angle formed by the tumour with POUPART's ligament, I was obliged to divide the fascia more freely towards the neck of the sac, in order

to reach the seat of stricture. The director was then passed without difficulty between the fatty covering of the sac and the outer layer of the fascia propria, and carried under the stricture. The blade of the bistoury was then passed along the groove, and the stricture divided in a direction towards the umbilicus. The intestine was immediately released from pressure; for, by applying a very moderate force to the tumour, the intestine immediately slipped up, and a small piece of omentum that remained, was readily returned by a little further manipulation."

The third patient was a lady, about fifty, with a femoral hernia about the size of a small orange, and singularly hard, being apparently filled with hard indigested matter. The operation was performed soon after the descent of the rupture. "The integuments were so loose over the tumour, that a transverse incision was sufficient to expose the closer investments of the sac; and the fascia propria being exposed, an aperture was made into it, and the director passed as high as the stricture. The cellular membrane and adipous structure were abundant, which allowed the director to pass readily between the layers; but it was necessary to depress the point very much, in order to pass it under the stricture. As soon as the knife was passed along the groove, both M. DESORMEAUX and myself distinctly heard the stricture yield; and at the instant that pressure was made on the swelling, the contents retired into the abdomen."*

In his general directions for the operation, Mr. KEY recommends a simple incision through the integuments, either perpendicular or transverse, and that the cellular membrane should be disturbed as little as possible, in order to lessen the chance of inflammation. When the fascia propria has been opened, so as to expose the adipous structure between it and the sac, "the director easily makes its way under this fatty matter as far as the neck of the sac, which lies deeper than the operator at first supposes. The point of the director should be applied rather to the inner than to the outer part of the neck of the sac, as it will be found more easy to pass under the stricture at this part. It should not at first be attempted to be thrust under the stricture, as the firmness of the parts forming the stricture would resist it. But the seat of stricture being felt, the

* P. 129—142.

operator should depress the end of the director upon the sac, which will yield before it, and then, by an onward movement, the director slides under the stricture." *

Mr. BRANSBY COOPER performed the operation on a patient in GUY'S Hospital within twenty-four hours from the occurrence of strangulation.* The subsequent progress was completely favourable, as in the three instances recorded by Mr. KEY.

* Pp. 143, 144.

† *London Medical Gazette*, vol. 13, p. 396.

CHAPTER XVII.

On Umbilical Ruptures.

SECTION I.—ANATOMY OF THE UMBILICUS.

THE navel, if we understand by this word the cicatrix, usually accompanied with a depression, remaining after the separation of the navel-string, does not exist before birth.

The navel-string, which is larger in proportion to the body the younger the fetus, is covered for a few lines by a continuation of the abdominal integuments, which form a kind of sheath, terminating by an undulated margin, and distinguished by a clearly defined line from the smooth covering of the cord. The surface of the abdominal cavity, in the corresponding situation, is smoothly lined by the peritoneum, without any opening or depression; the umbilical arteries, vein, and urachus, lying between that membrane and the linea alba, and being accompanied in their passage through the tendinous ring only by cellular substance. If, however, the cord be pulled outwards, the peritoneum is drawn into a little depression or pouch; if we pass the end of the finger along the inner surface of the linea alba, we find this opening to be its weakest part, and slight pressure, either with the finger or an instrument, forces the membrane into it.

The peritoneum may be easily separated, by dissection in a mature fetus, from the linea alba and the umbilical vein;

and still more easily from the upper portion of the tendinous ring, under which the vein passes; a loose cellular substance forming the only connexion between the vein and the corresponding portions of the membrane and the aperture. The umbilical arteries are more closely attached, both to the peritoneum and to the umbilical ring.

The latter consists, in its upper half, of strong semi-circular tendinous fibres, with a well-defined margin, forming an arch under which the vein passes, and connected to it by loose cellular tissue; the lower half is not so strong or well-defined, and its tendinous fibres are attached to the umbilical arteries, so that these parts cannot be separated without cutting the fibres.

The linea alba itself is less firm in the mature embryo than in a child of some weeks old; the umbilical ring is in its broadest and strongest part, and the tendinous fasciculi are here most strongly marked.

The only vessels in this neighbourhood are small and insignificant ramifications of the epigastric arteries and veins.

That portion of the cord which remains attached to the body of the child, dries up after birth, as far as the edge of the small cutaneous sheath, which is continued over its termination from the integuments of the abdomen. An ulcerated groove commences at this edge, and, extending from the circumference towards the centre, detaches the dried portion, and the surface cicatrizes. The process occupies from three to six days. The cicatrized portion forms the small oval depression called the navel, which feels rather firmer than the surrounding skin, and exhibits no trace of the umbilical vessels.

The latter are completely closed, and reduced into small firm cords, in the first week after birth. This change is so analogous to the invariable course of nature in other instances, where blood-vessels no longer transmit any fluid, that we feel a difficulty in believing the alleged examples, in which the arteries or vein are said to have been found open to the navel in the adult.* At that age the fibrous cords, which represent these vessels, are so slender, that we sometimes find it difficult to trace them from the navel to the liver or bladder.

* BOEHMER *de necessaria funiculi umbilicalis deligatione*, in HALLERI *Dissert. Anat.* tom. v.; HALLER, *Element. Physiolog.* lib. xxx. sect. 1.

These slender threads, with some thickened cellular substance, occupy the umbilical ring in the adult ; the strong tendinous fibres of the linea alba are intermixed with them, so as hardly to present any appearance of an opening. The cicatrix of the integuments is connected to the same parts on the outside ; and, as this adhesion is firm and inseparable, the depression of the navel appears deeper and deeper in proportion as the individual grows fatter.*

SECTION II.—GENERAL OBSERVATIONS ON UMBILICAL RUPTURES.

The terms *exomphalos*, *omphalocele*, and *umbilical hernia*, are applied to that species of rupture, in which the abdominal contents are protruded through the opening in the linea alba, which transmits the umbilical vessels of the fetus, or in the immediate vicinity of that part. Whether the protrusion take place most frequently in the former or in the latter of these two situations is a question, the determination of which can be of no practical consequence, although it might perhaps influence the name of the complaint. The term *exomphalos* can be applied with propriety to that rupture only which occurs at the umbilicus ; while any displacement of the viscera through the linea alba in the neighbourhood of the navel should be classed with ventral herniæ.

It was observed by PETIT,† that, in the adult, the parts are most frequently protruded at one side of the umbilicus : but Sir A. COOPER‡ is of opinion that they usually take their course through that opening itself. It seems probable that there may be a difference in this respect, according to the period of life at which the complaint occurs. The tendinous ring, which transmitted the umbilical vessels, does not immediately close after the formation of the

* A minute account of the anatomy of the umbilicus, and its changes, illustrated by figures, will be found in SOEEMMERRING's German tract *on the Cause, Structure, and Treatment of Umbilical Ruptures* ; Frankfort, 1811, 8vo.

† *Tr. des Mal. Chirurg.* tom. ii. p. 250. “ La hernie ombilicale, proprement dite, celle qui sort précisément par l'anneau ombilical, est une maladie propre à l'enfance.”—SCARPA, p. 318.

‡ *On Crural and Umbilical Hernia*, p. 35.

cicatrix : it presents an aperture, through which the viscera may be easily protruded, under the action of those causes which are capable of producing ruptures. The parts, however, slowly contract ; and the navel gradually acquires that firmness, which characterises it in the adult. At this time the cicatrix possesses greater density and power of resistance than the neighbouring parts.

These anatomical facts will furnish us with two pathological inferences. First ; that infancy is more subject than any other age to umbilical herniæ, properly so called, where the viscera are protruded through the navel itself. Secondly ; that adults may be more exposed to that species of the complaint, in which the hernia takes place in the vicinity of the umbilicus. In all the instances, however, in which I have operated, it has appeared to me that the parts have been protruded through the umbilical ring.

The point at which the hernia protrudes is under the superior arch of the umbilical ring, close to the passage of the vein. SOEEMMERRING* has found this in several exomphali, both of young and older subjects.

The form of the swelling varies according as the subject is fat or thin : in the latter case it is free and pendulous ; in the former, larger at its basis, less prominent, and nearly hemispherical.

The umbilicus is not equally distended by the protrusion in every direction ; it yields irregularly, and the cicatrix is usually seen on one side of the tumour.

The protruded parts will naturally tend downwards ; so that the opening into the abdomen is from the upper part, and not from the middle of the swelling. As the rupture grows larger, this observation becomes more and more applicable.

If neglected, it increases considerably, descending to the pubes, and even over the pudenda, subject to painful ulcerations difficult to heal, incapacitating the patient for active exertion, and forming a constant source of intestinal affection.

Sir ASTLEY COOPER observes that the irreducible exomphalos sometimes grows to an enormous size in women, who, from having borne many children, have a pendulous abdomen. In three such instances he had seen the hernia reaching so low as entirely to cover the pudendum. The tumour measured in one case ten inches in length, eight in

* Lib. cit. p. 43 et seq. fig. 6.

breadth at the upper part, seven in the lower. The largest he had seen was in a patient of Mr. GASELEE: it measured twenty inches across by seventeen.*

When the subject is fat, the rupture may extend between the integuments and muscles, without causing external swelling; nay, the navel may even present its ordinary concavity.

The opinions of different writers concerning the sac of the umbilical hernia are much at variance with each other. Many surgeons have denied the existence of a hernial sac in the exomphalos. The names of DIONIS,* GARENGEOT,† and J. L. PETIT,‡ may be cited in exemplification of this remark. They state, that as the peritoneum has cicatrized at the navel, it must be burst by the protrusion of the viscera. SHARP§ has met with a sac in the exomphalos, but seems to think that it is often wanting. The subject, long ago correctly stated by BARBETTE,|| has been rightly represented by Mr. POTT.¶ “Whatever,” says this excellent surgeon, “are the contents, they are originally contained in the sac formed by the protrusion of the peritoneum.” He then adds, that this sac is visible in recent and small ruptures, but that it cannot always be distinguished towards the navel in old and large ones. RICHTER** is undetermined on the point in question. He thinks it difficult to explain why the protruded viscera should not have the usual covering in this species of rupture; and he quotes SCHMUCKER and SANDIFORT as having observed a sac in cases of exomphalos. Yet he gives up his own opinion to the weight of authority, and concludes that an umbilical rupture, occurring in the adult, is not covered by peritoneum.

The erroneous notion, that the viscera, in exomphalos, are not included in a hernial sac, has arisen from the mistaken supposition that the umbilical vessels perforate the

* Part ii.; edit. 2, p. 34.

† *Cours d'Operations*, par DELAFAYE, p. 106.

‡ *Mémoires de l'Acad. de Chirurg.* tom. i. p. 702.

§ *Traité des Mal. Chir.* tom. ii.

|| *Critical Inquiry*, p. 50.

¶ *Opera Chirurgico-Anatomica*; Ludg. Bat. 1672, p. 33.

** *Works*, vol. ii. 165. Other writers have also described the existence of a hernial sac in exomphalos. See MORGAGNI, *Epist.* 34, art. 11; HALLER, *Opusc. Pathol.* obs. 29 et seq.; SANDIFORT, *Obs. Anat. Pathol.* lib. i. p. 74; VERDUC, *Pathol. de Chirurg.* tom. ii. p. 482.

†† *Traité des Hernies*, ch. xxxv.

peritoneum where they enter the body of the fetus. This error could never have been entertained by a person acquainted with the true structure of the parts, since he must have known that the peritoneum is as entire here as in any other part of the linea alba. It often happens, indeed, in consequence of that membrane being closely connected to the inflected cicatrix of the integuments, that the distinction between the skin and hernial sac cannot be traced on the front of the tumour; but it is even then easily discerned in every other part of the circumference. In other cases a hernial sac can be demonstrated over the whole exomphalos, just as clearly as in any other species of rupture.*

The umbilical hernia is not only furnished with a true peritoneal sac, but it possesses likewise a more superficial investment, derived from a condensation of the surrounding cellular substance.

The peritoneal covering of an umbilical rupture sometimes presents an unusual appearance. It consists, on the anterior part of the swelling, of fibres, irregularly interwoven, and separated by more or less considerable intervals in which there is no serous membrane, as if the peritoneum had undergone partial rupture, or fraying from distension. There is a specimen of this kind in the museum of St. BARTHOLOMEW'S HOSPITAL; and Mr. STANLEY, who directed my attention to it, suggested the explanation of the peculiarity. He has observed occasionally, that the peritoneum, along the middle line of the abdomen, especially in the region of the umbilicus, presents naturally this imperfect or frayed appearance, which would necessarily be increased, if a rupture should occur, by the distension which the membrane would then experience. In these cases there is a real though partial deficiency of the hernial sac. Again, it must be remembered, that in the middle of the abdomen the peritoneum is not only extremely thin, but closely adherent to the sheath of the rectus. Hence it is likely to undergo partial rupture or fraying from distension when protruded in an exomphalos.

The practical precept, derived from the supposed absence of the hernial sac, of proceeding with great caution in

* For representations of the hernial sac in various umbilical ruptures, see the 10th plate of SCARPA; also fig. 1 and 2, pl. 9, of Sir A. COOPER'S *Anatomy, &c. of Crural and Umbilical Hernia*.

exposing the contents of an umbilical rupture, when it requires the operation, is just as necessary as if the anatomical observation, which suggested it, had been strictly correct. The hand of a prudent operator will be guided by this maxim in every species of rupture; but more careful attention to this point is necessary in the present case, since the integuments and hernial sac are often inseparably blended on the front of the tumour. It may indeed be noticed, as a general observation, that the coverings of an umbilical rupture are frequently thin. This probably arises from the distension which they experience in a large and old exomphalos, and from the partial rupture of the peritoneum, which will account for several phenomena that have been observed in these cases, as well as for the incorrect opinion respecting the want of a hernial sac. The contained viscera have been found in many instances adhering to the integuments.* Sir A. COOPER† has seen portions of the omentum contained in an exomphalos passing through openings in the sac; and has even known intestine to be strangulated in a similar aperture.‡

Besides the causes, which have been stated in the general description of herniæ, there are some of a local nature, which will act particularly in contributing to the formation of umbilical ruptures. In ascites the navel is often distended into a pouch, which, however, contains nothing but the dropsical fluid. Under the great accumulation which takes place in some instances, the tumour has burst. The enlargement of the abdomen in pregnancy often produces this rupture, by weakening the navel or immediately surrounding fibres of the linea alba; and excessive corpulency acts in the same way in both sexes.

The distension of the linea alba by the gravid uterus so strongly favours the occurrence of exomphalos, that the number of females afflicted with this rupture greatly exceeds that of males. In 71 cases observed in Holland, there were only 17 men:* of 3,439 patients with umbilical

* ARNAUD on *Hernias*, p. 323; and in the *Mem. de Chirurg.* tom. ii. p. 590. He mentions in the latter work an instance in which the bowel adhered to the skin so strongly, that it was cut in dissecting the parts after death.—MONRO *Obs. on Crural Hernia*, p. 24; COOPER on *Crural and Umb. Hernia*, p. 37.

† Libro citato, p. 36.

‡ *Ibid.* p. 46.

§ SOEEMMERRING, *Ueber die Ursache, &c. der Nabel Brüche*, § 59.

hernia relieved by the City of London Truss Society, 2,775 were women, 664 were men. (See note in chap. i. sect. ii. p. 11.)

If we put out of the question the operation of this particular cause, it will be found that navel ruptures are much less frequent than the inguinal or femoral. The smaller size and firmer structure of the umbilical aperture, its higher situation in the body, and its not being exposed, as the abdominal and femoral rings are, to the perpendicular pressure of the viscera, are sufficient causes for this difference. MONNIKHOFF* saw 71 exomphali in 2,000 ruptures, and CAMPER † informs us, that of 1,968 cases, for which trusses were delivered at Amsterdam, there were only 10 umbilical herniæ. Of 83,584 cases relieved by the City of London Truss Society, 3,439 were umbilical, 7,987 femoral, and 64,671 inguinal. Of the preceding number, 67,798 were males, of whom only 664 had exomphali, while of 15,786 women, 2,775 had navel ruptures. (See the note at p. 11.)

The contents of an exomphalos are the omentum, with or without a portion of intestine. An umbilical rupture in the adult rarely contains intestine unaccompanied by omentum. A large strangulated exomphalos, however, on which I operated with success, contained small intestine only, of which there were several convolutions. The relative situation of the parts in the belly explains why the omentum often surrounds and envelops the intestine. The transverse arch of the colon is the gut most frequently protruded in this hernia, as we might have inferred from considering its natural situation in the abdominal cavity; but the presence of the small intestine is by no means an unfrequent occurrence; and even the cæcum has been protruded at the navel.

A patient labouring under exomphalos is still more subject, than those with other herniæ, to colic, flatulence, vomiting, and the various species of intestinal derangement. Hence particular attention is required to the quantity and quality of the food, and to the preservation of the digestive organs in a healthy state.

In strangulated exomphalos the parts are compressed by the margin of the tendinous opening. The neck of the sac

* SOEEMMERRING, loco citato.

† *Dissertationes decem*, vol. ii. p. 522.

may be recognised as a possible seat of stricture; but I have not seen such an occurrence. A portion of the protruded intestine or omentum has been known to pass through an opening in the sac; and strangulation might occur in such an opening.

I shall divide the observations, which I have to make on the treatment of umbilical hernia, into three parts, according to the natural and essential distinctions in the complaint. These divisions will be; first, congenital exomphalos; secondly, that which occurs in young subjects; and thirdly, that of the adult.

SECTION III.—CONGENITAL UMBILICAL HERNIA.

The first species of the complaint may be termed congenital with the greatest propriety; for it exists at the time of birth. It is even found in the youngest embryos; * so that we can have little hesitation in ascribing it to an original deficiency in the formation of the part. Hence perhaps the term rupture is not strictly applicable to it: indeed, from the situation of the fetus in utero, and the absence of respiration, the occurrence of a rupture seems hardly possible before birth, except in the case of the testicle carrying with it through the ring a preternaturally adherent portion of intestine or omentum.

The tumour appears as if formed by the dilatation of that extremity of the umbilical cord, which is connected to the child's body. Generally it has a more or less conical figure: the basis is attached to the abdomen, and the round tendinous opening, by which the viscera protrude, occupies its centre: the umbilical cord appears to arise from the apex of the swelling. The coverings are thin, soft, and

* ALBINUS delineates an example of it in an embryo less than two inches in length; *Annot. Acad. lib. 1, tab. 5, fig. 3.* WRISBERG represents it in an embryo of ten weeks; *Descriptio Anat. Embryonis, &c. fig. 1 and 2*; or in SANDIFORT'S *Thesaurus disp. anat. v. 3*: and Dr. HUNTER, in his *Anatomy of the gravid Uterus, tab. 33, fig. 3.* SOEMMERRING has met with two analogous instances: *über die Ursache, &c. der Nabel Brüche*, p. 31; and another is represented by SCARPA in his tenth plate, fig. 3.

transparent, so that the contents can be readily perceived externally. The external surface is polished, and exactly resembles, both in appearance and structure, that of the cord. The base of the swelling is covered, for a short extent, by integuments. Internally the cavity presents a smooth peritoneal production, which lines it throughout.

The umbilical vessels are generally divided by the swelling; the vein going above, and the arteries below, or on one side.*

The deficiency in the abdominal muscles, causing this congenital species of umbilical hernia, is by no means an unfrequent occurrence, both in its greater and smaller degrees. Dr. HAMILTON † of Edinburgh has usually seen about two instances of it annually, in the last seventeen years. A German writer, ‡ in a dissertation on this subject, refers to thirty-eight recorded cases; besides which several examples of it have been seen by HALLER, § MORGAGNI, || WRISBERG, ¶ SANDIFORT, ** BONN, †† SOEMMERRING, ‡‡ HEY, §§ and others. |||

The most common contents of the tumour are a portion of small intestine; but we may find in it the large intestine, omentum, stomach, liver, ¶¶ and spleen.

* The anatomy of the congenital umbilical hernia is represented by SCARPA, pl. 10, fig. 1 and 4.

† COOPER, on *Crural Hernia*; p. 57.

‡ FRIED, *de fœtu intestinis plane nudis extra abdomen propendentibus nato*; in SANDIFORT'S *Thesaurus diss.* v. 1.

§ *Opuscula pathologica*; or in the *Opera minora*, vol. iii. p. 315. Two cases.

|| *Epist.* 48, art. 48 and 53.

¶ In RUDOLPHI, *diss. de peritonei diverticulis, illisque imprimis quæ per umbilicum et lineam albam contingunt*; Goett. 1780. Three cases.

** *Obs. Anatomico-patholog.* Lugd. Bat. 1778, lib. i. cap. iv. and lib. iii. tab. 1: also in *Museum Anat. Acad. Lugd. Bat.* 1793, tab. 120 and 126.

†† *Transactions of a Society at Amsterdam, for promoting Medical Knowledge*; vol. ii. p. 133. Several cases.

‡‡ *Abbildung und Beschreibung einiger Missgeburten*, 1791, tab. 8 and 10; *über die Ursache, &c. der Nabel Brüche*, p. 31 et seq. Five cases.

§§ *Practical Observations*, 3d ed. p. 232 et seq. Three cases.

||| VAN DOEVEREN, *Specimen Observ. Anat.* cap. ii. BUCHHOLTZ *de Hepatophalocoe congenita*. Argentorat, 1758. An excellent description with plates. DEWIND, *Transactions of the Society of Sciences at Flushing*, 1775. DE MAN, *Transactions of the Haarlem Society*, v. 19, p. 179. STARKE, *Archiv für Geburtshülfe, &c.* vol. i. tab. 1 et 2; vol. iii, p. 89; vol. iv. p. 646. AMYAND in *Philos. Trans. abridged*, vol. vii. p. 529.—RUYSCH, *Obs. Anat. Chir.* obs. 71—73. VOIGTEL contains an immense number of references; see his *Handbuch der Patholog. Anat.* vol. ii. p. 370—372.

¶¶ The first figure of SCARPA'S tenth plate represents a congenital exomphalos of moderate size in a fetus apparently full-grown. The rupture contained a portion of liver, which had acquired a cylindrical form.

The deficiency of the abdominal parietes is found in different degrees in different instances; hence the quantity of parts unnaturally situated, the bulk of the tumour, and the chances of recovery, are very various.

Sometimes the tumour, containing merely a small portion of intestine, has been so inconsiderable as to be unnoticed at first: SABATIER* has seen the intestines wounded in the act of tying and dividing the cord in such instances, and the same circumstance has been witnessed by others.† There may be a swelling of greater magnitude, though still of moderate size, equal, for instance, to a hen's egg, containing nothing but some convolutions of small intestine. We may undertake the treatment of such exomphali with fair prospect of success.

In a second description of cases, where either the whole or the largest part of the intestinal canal is contained in the hernial tumour, we have little reason to expect that our curative efforts will be successful; yet we should not be discouraged from such attempts at relief as the circumstances admit.

There is a third and yet more extensive degree of this unusual formation, in which the very nature of the affection seems to preclude all hope of assistance from the art of surgery. The dissection of such cases has shown the liver, stomach, spleen, omentum, large and small intestines, lying in the umbilical tumour.‡ Often too it has been accompanied by malformations of other parts.

The instances in which the whole anterior and lateral parts of the abdominal parietes are deficient, so that the viscera lie exposed on the surface of the body, seem to be only more complete specimens of the latter kind of deformity; and should therefore be classed under a common head with the above-mentioned cases. SOEEMMERRING§ has delineated this kind of unnatural formation; which I have seen more than once, both in the human subject and in animals.

* *De la Médecine Opératoire*, tom. i, p. 152.

† PARE', lib. 23, cap. 66; MAURICEAU, *Traité des Accouchemens*, tom. i. p. 497; *Miscellan. Nat. Cur.* Dec. 2. Ann. 3, obs. 128.

‡ MERY, *description de deux exomphales monstrueuses*, in the *Memoires de l'Acad. Royale des Sciences*, 1716, p. 126; HALLER *Op. Minor*; tom. iii. p. 316. SOEEMMERRING, *Abbildung, &c.* tab. 10, fig. 3; DEWIND, as quoted before.

§ *Abbildung einiger Missgeburten*, tab. 8. Many similar facts are quoted in VOIGTEL *Handbuch der pathologischen Anatomie*, vol. ii. p. 313.

TREATMENT.*—It comprehends, as in other herniæ, the twofold object of replacing the contents of the swelling in the abdomen, and preventing a renewal of the protrusion. The necessity of accomplishing these points is more urgent here than in ordinary ruptures; because that part of the coverings of the tumour, which consists of an expansion of the cord, will dry up and separate after birth, so as to expose the parts, if they be still prolapsed; an occurrence highly dangerous, if not inevitably fatal.

For the purpose of confining the parts, when replaced, compresses with bandages, or the ligature, have been employed. The former method was adopted with success by Mr. HEY.

CASE.—“ In November, 1772, I was desired to visit an infant born with an uncommon tumour at its navel. I found the funis umbilicalis distended to the bulk of a hen’s egg at its insertion into the abdomen; though it was of the usual thickness in every other part. The distension of this part of the funis had rendered its external coat so transparent, that I could clearly discern through it the folds of the small intestines, which had been protruded through the navel, before the child was born. I immediately reduced the intestine, and desired an assistant to hold the funis compressed so near to the abdomen, that the intestine might not return into the hernial sac. I procured some plaster spread upon leather, cut into circular pieces, and laid upon one another in a conical form. This compress I placed upon the navel, after I had brought the skin on each side of the aperture into contact, and had laid one of the lips a little over the other. I then put round the abdomen a linen

* RUYSCH appears to have found this congenital deficiency in the structure of the navel constantly fatal; and not to have attempted anything in the way of cure. Perhaps he met with it only in its worst form. “ Multoties infantulos vidi in lucem editos, quibus abdominis cutis et musculorum pars in ambitu funiculi deerant, magnitudine solidi argentei, ita ut intestina eo loco, tenuissimâ tantum pelliculâ tegerentur. Hunc affectum sæpius a me visum, ast nunquam curatum memini; omnes enim ab utero ad tumulum delati fuere, 5to, 6to, 7mo, 8vo, aut 9no die.”—*Observ. Anat. Chir.* Obs. 71.

SCARPA’s experience seems to have been nearly similar in its result: “ Les enfans, qui naissent avec une hernie ombilicale, vivent, pour l’ordinaire, fort peu de tems; soit parce qu’ils ont, presque toujours, d’autres vices de conformation dont les suites sont plus dangereuses, tels que le spina bifida, le développement incomplet des os de la tête, la foiblesse des muscles abdominaux, un gonflement énorme des viscères du bas-ventre, et particulièrement du foie; soit parce que les parties qui forment la hernie, sont, dans la plupart de ces cas, irréductibles à cause des fortes adhérences qu’elles ont contractées avec le col du sac herniaire.”—P. 324.

belt, and placed upon the navel a thick circular quilted part, formed about two inches from one extremity of the belt. This bandage kept the intestine securely within the abdomen, and was renewed occasionally. The funis was separated about a week after birth; and at the expiration of a fortnight, from that time, the aperture at the navel was so far contracted, that the crying of the child, when the bandage was removed, did not cause the least protrusion. I thought it proper, however, to continue the use of the bandage a while longer."*

A congenital umbilical hernia of three inches diameter was cured in the same way in a month. †

Dr. HAMILTON has communicated, in a letter to Sir A. COOPER, ‡ a successful instance of a different mode of treatment in a very similar case. After reducing the contents of the swelling, and applying a tight ligature round its base, the Doctor states that he brought together the edges of the parietes abdominis by means of two silver pins and adhesive straps, and that in a few days the cure was complete.

Mr. HEY's treatment is preferable to that of Dr. HAMILTON: being much safer, and having proved equally successful.

When, as it frequently happens, the tumour is of a more considerable size, its cure is more doubtful, although it would certainly be the surgeon's duty to make the attempt. Mr. HEY § returned the parts in a case where the whole intestinal canal seemed to be contained in the swelling, which projected four inches from the body, though the aperture was very small: the patient only lived two days. In another case, where the tumour burst during parturition, he carefully replaced the viscera, but the termination was fatal. ||

* *Practical Observations*, 3d ed. p. 232.

† BUCHHOLTZ, in his tract already quoted, *de Hepato-omphalocoele Congenita*.

‡ *On Crural and Umbilical Hernia*, p. 56.

§ *Practical Observations*, 3d edit. p. 234.

|| *Ibid.* p. 233.

SECTION IV.—UMBILICAL HERNIA IN YOUNG SUBJECTS.

The contraction of the tendinous ring of the *linea alba*, and the consolidation of the *cicatrix*, in which the fibrous cords representing the former umbilical vessels, the inflected integuments of the navel, and the aponeurotic fibres, are firmly united together, proceed gradually after the separation of the cord: the parts do not acquire at once that solidity which they possess in the adult. The period of life in which this process is going on is particularly favourable to the occurrence of *exomphalos*; and a much greater number of such ruptures takes place in the first months after birth, than in all the subsequent years.

That there is a natural weakness of construction, favouring protrusion in particular individuals, is probable; although it cannot be stated on the ground of actual observation. Young children are subject to many of the occasional causes of *herniæ*; such as violent exertions of the abdominal muscles in long-continued crying, convulsions, and coughing; distension of the stomach and bowels from colic, constipation, and the various intestinal affections; absurd and not yet universally exploded practices of tight swaddling clothes and bandages.

Surgical writers have assigned other causes of a more local nature, and dubious efficacy: thus some have ascribed umbilical *herniæ* to cutting off the cord too short, and some to leaving it too long. A neglect of the supposed necessary precaution of keeping up pressure by means of compress and bandage, after the separation of the *funis*, has been very generally represented as a cause of navel ruptures in infants.

It may be doubted whether this umbilical bandage is either useful or necessary in any case; but its injurious effects, when narrow and tight, are evident and certain. Not to mention the painful nature of such restraint on a part naturally moveable, and designed to move freely in the various functions executed by the thoracic and abdominal organs, we cannot doubt, that if it should prevent protrusion at the navel, it must favour its occurrence at the groin.

† SCARPA, tab. x. fig. 2.

“ I am very much mistaken,” says SOEEMMERRING, “ if I have not, both as a father and a physician, seen many ill effects from the unnecessary and injudicious employment of umbilical bandages. My opinion has been asked concerning the rejection from the stomach of the best and most natural milk by healthy and quiet children. On feeling the abdomen, I have found it closely girt by a bandage applied with the view of preventing a navel rupture. Finding everything natural about the umbilicus, I have ordered this bandage to be laid aside, and the evil immediately ceased.”*

When we observe that animals, in whom the horizontal position of the body is attended with a perpendicular pressure of the abdominal viscera against the umbilical region, always escape umbilical ruptures, we shall probably suspect that the assistance of a bandage is not necessary in the human subject. At all events, it need not be employed unless we should notice some swelling or elevation of the navel after the cord has separated. In that case, we should use a bandage not less than three fingers in breadth ; and be careful not to fasten it too tightly. A prominent navel is sometimes seen in children, who have worn such a bandage for months after birth ; while the occurrence of exomphalos cannot be traced, in any instance, to the neglect of this measure.

I should consider, however, that a strip of adhesive plaster, applied across the belly so as to close the umbilical ring, is preferable to any bandage in what nurses call starting of the navel.

Although we should have expected these herniæ to occur soon after birth, it appears, from the numerous observations of DESAULT, that they take place most frequently at the second, third, and fourth months ; he states indeed that the complaint appears at this period in nine cases out of ten. The abdominal contents, protruded against the opening by the repeated cries of the child, distend and dilate it, and, carrying before them a portion of the peritoneum, form a small tumour, which gradually increases in size, and possesses the usual characters of a rupture.

The disease consists of a soft elastic swelling, situated at the navel, varying in size from that of a nut to that of a small apple, and seldom exceeding the latter magnitude.

* *Ueber die Ursache, &c. der Nabel-Brüche*, p. 73.

It is usually rounded, sometimes conical, but always circular at the basis. It is larger and more tense when the child cries, coughs, or strains, smaller and flaccid at other times. It is covered by the integuments, which are in a normal state: one spot, smoother than the rest, is the cicatrix of the navel. The contents recede in the recumbent position or on gentle pressure, leaving a thin empty bag.

There is hardly any affection, with which such a rupture in a child can be confounded. Sometimes a small red prominence moistened by a mucous secretion is found at the navel of children. In the last case of this, which I saw, the swelling was of regular circular outline, about three quarters of an inch high, and as much in diameter. At the basis, which was not contracted, the boundary between the common integument and the preternatural substance was marked by a defined line. The summit was circular and as large as the basis; and there was an opening in the centre. The appearance and feel of the tumour were exactly like those of mucous membrane, and the surface was moistened with a similar secretion. The colour was a bright red, like that of the internal surface of the stomach when minutely injected with size and vermillion. I applied a ligature to the base tightly, so as to strangulate it; this caused pain which soon went off. The dead part separated in three or four days, and the surface healed readily, leaving a sound navel. There is no resemblance, either in appearance or construction, between these vascular productions and umbilical ruptures.

The presence of the protruded parts maintains the umbilicus in an open state, and opposes the natural tendency of its margins to contract. This disposition, however, sometimes exceeds the resistance of the hernial contents, and, forcing them back into the cavity, obliterates the opening through which they had proceeded, consolidates the parts, and thus produces a spontaneous cure. DESAULT has furnished us with two examples of this kind.* A child of two years old was brought for his opinion concerning an umbilical tumour, produced some months after birth, in consequence of the whooping-cough. The swelling, which equalled in size a large nut, yielded to the pressure of the finger, but returned on the least exertion of the abdominal muscles. DESAULT proposed the ligature, but

* *Œuvres Chirurgicales de DESAULT par BICHAT*, tom. ii. p. 318.

could not obtain the consent of the relations; when this patient was seen for another complaint, the following year, the tumour had completely disappeared. The parents stated that no external application had been used, but that the swelling went away spontaneously.

In another patient, aged five years, an umbilical rupture had subsisted from the time of birth. The application of the ligature, which had been recommended by DESAULT, was delayed in consequence of the appearance of the small-pox. When the child had completely recovered, it was found that the tumour had diminished in size, and that the opening, through which the viscera had protruded, had become considerably contracted. Struck by this phenomenon, DESAULT conceived that nature alone might accomplish a cure, and did not interfere with the progress of the case. In the course of a few months the swelling had entirely disappeared.

SOEMMERRING* and BRUNNIGHAUSEN† have both seen several instances of even considerable umbilical ruptures in young persons disappearing in the course of years without any surgical assistance.

The disposition of the umbilical ring to close, manifested in such occurrences, is an important circumstance in treating the complaint; but it must not be relied on exclusively, since spontaneous cures are by no means frequent. In general, when the progress of a case is left to nature, the cure in the course of time becomes nearly impossible. The umbilical ring gradually loses its disposition to contract; so that the aperture would not become obliterated at this period, even if the protruded viscera were kept in the reduced state. Hence we perceive that there is an essential difference in the nature of the umbilical rupture, as it occurs in the infant or the adult; and that this distinction is derived from the tendency to contraction in the tendinous ring. In the former case a radical cure is easily obtained; in the latter it is nearly impossible. In the one instance it is sufficient to keep the viscera within the abdomen, and the ring will contract of itself. In the other the opening remains, whether it be occupied by protruded viscera or not. Hence also it follows, that practical observations, drawn from one form of the complaint, cannot be applied to the other.

* *Ueber den Nabelbrüchen*, p. 74.

† LODER'S *Journal für Chirurgie*, B. ii. p. 1.

In treating that species of exomphalos, which we are now considering, our object is to obtain a radical cure. By returning the protruded parts, and keeping them reduced, the umbilical ring will contract, and become obliterated, so as to prevent any future protrusion. There are two methods by which this may be attempted, viz. compression, by means of bandages; and the ligature. The latter has in its favour the sanction of antiquity, but was almost superseded by the general adoption of the former method, when the celebrated DESAULT again brought it into use, and recommended it very warmly on the authority of his extensive experience. I shall present the reader with the result of the practice of the French surgeon, in his own words; and hope that the length of the extract will be excused, from the celebrity of the author, and the importance of the subject; particularly when it is considered, that the work* from which it is taken has not been translated into the English language.

“The ligature and compression are both employed with the same object; that of preventing the viscera from remaining within the umbilical ring, and thereby favouring the approximation of the sides of the opening. In the first of these methods, the hernial sac, and the integuments which cover it, are removed; and the cicatrix formed after their destruction opposes the displacement of the bowels, while the margins of the opening, obeying the natural impulse which leads them to contract, and irritated by the operation which they have undergone, approach to each other, and unite, so as to obliterate the ring. In the treatment by compression, the place of the deficient portion of the abdominal parietes is supplied by a foreign body applied externally, which keeps the intestines within the cavity, so that they cannot offer any obstacle to the contraction of the umbilical ring. The two processes are founded therefore on different principles, and reason and experience prove that their results differ accordingly.

“It must be allowed, that compression is attended with no pain, but it produces inconvenience and restraint during the whole long space of time for which it must be continued. The ligature causes a momentary pain, but is attended with no subsequent restraint; it produces in a few days what

* *Œuvres Chirurgicales de DESAULT, par BICHAT.*—See the “*Mémoire sur la Hernie Ombilicale des Enfants,*” tom. ii. sect. iv.

compression only effects, when it succeeds, in several months.

“ In the one case, a constant and long-continued attention is required ; if the treatment be suspended for the shortest interval, great risk is incurred of losing the benefit previously gained : in the other, on the contrary, the object is attained to a certainty in spite of the cries of the child, and independently of the attention of its nurses. The margins of the opening being compressed in the former method, the natural action of the parts must be impeded ; while in the latter, by superadding an artificial irritation to the tendency which the parts naturally have to contract, the obliteration of the opening is hastened and assisted.

“ When compression is employed, it is produced by means of a flat body, or of a round oval substance adapted to the form of the opening. In the former case, if the bandage is applied with precision, the skin and sac, forming a fold, are pushed into the opening, and impede its obliteration by producing the same effect from without inwards, which the protruded viscera did from within outwards. The other method is exposed still more strongly to the same objection. By the ligature, the hernial sac and integuments are removed, and there is no obstacle to the obliteration of the opening. If the means of compression be not applied accurately, and kept uniformly in their proper situation, a portion of omentum, or bowel, may escape, and frustrate the object of our attempts. Supposing the compression to succeed, both methods accomplish the closure of the navel : but, under the employment of the ligature, there is superadded to the contraction of the aperture, an agglutination of its sides produced by the operation, and conferring a degree of solidity on the union, which can be obtained by no other process.

“ Experience confirms the theoretical statement which we have just given of the comparative merits of the two methods of treatment. On one side, we shall find the successes of compression occur amongst its failures ; and we shall see infants, on whom it is employed, suffering for years the trouble and inconvenience inseparably attending it. The ligature, on the other hand, as employed at the Hôtel Dieu, presents an uninterrupted series of well attested cures, which have amounted in the practice of DESAULT to more than fifty. In the latter years of his life, parents

often brought their children to the public consultation, where the operation was performed immediately, and without any preparation. The patients were afterwards brought daily to the hospital, to be seen and dressed until the cure was completed.

“ To these considerations must be added others, which will have some weight in influencing our determination. A poor person insures the cure of his child, by passing a few days in an hospital, under the employment of the ligature: while, if compression be used, he is exposed to the frequent repetition of expense for the purchase of bandages, and to loss of time in paying the attention which this mode of treatment indispensably requires.

“ The ancients employed the ligature in various ways; but the proceedings which they have transmitted to us may be referred to two heads. One consisted simply in returning the viscera, and placing a ligature on the integuments and sac: in the other, the swelling was opened either before or after the application of the ligature, to ascertain that the parts were all completely returned. CELSUS* adopted the first of these methods: PAUL of Egina chose the second, and was followed by the Arabian physicians, and by those more modern practitioners, whose knowledge was derived from Arabian authors. The works of AVICENNA, ALBUCASIS, and GUY DE CHAULIAC, prove this assertion.

“ We shall not be long at a loss in determining which of these methods deserves our preference. One is less painful, and equally certain; for surely a person can have no difficulty in deciding, by pressing the sides of the sac against each other, whether or no the protruded parts are completely returned. The other, with an useless cruelty, adds to the pain without increasing the certainty of the operation. This last has been generally adopted; and PARE', who describes it, does not even mention the other method. Other variations again took place in the manner of operating. Some simply tied the base of the tumour, while others transfixed it with one or two needles in order to make the ligature more secure; and sometimes even made circular incisions with the same object. It is particularly in the Arabian writings that we meet with this process, which is not only cruel but superfluous; as the ligature, when properly applied, never fails. It is also described by

* *De Medicinâ*, lib. vii, cap. xiv, *de umbilici vitiis*.

PARE'; but SAVIARD, the only modern practitioner who has treated the exomphalos by means of ligature, followed the method recommended by CELSUS, SABATIER, in his learned work on the operations, speaks of both methods without deciding which merits the preference. The operation of DESAULT, nearly resembling that of SAVIARD, is simple, and attended with very little pain. It is performed in the following manner:

“ The child, on which it is to be performed, should be laid on its back, with the thighs a little bent, and the head brought forwards on the chest. The surgeon, having returned the protruded viscera, presses on the opening with one hand, while with the other he raises the sides of the sac, and slides them between his fingers, to ascertain that no part remains unreduced. When he has assured himself that the parts, which he holds, consist of nothing but the integuments and hernial sac, his assistant passes a waxed ligature of moderate size several times round their basis, securing it at each turn with a knot, drawn with sufficient tightness to cause an inconsiderable degree of pain. The tumour, being thus tied, should be covered with lint; over which there should be applied one or two compresses fastened on by a circular bandage, which should be secured by means of a scapulary.

“ On the succeeding day a slight swelling of the tumour is perceived, analogous to that which occurs in a polypus, after tying its basis, and attended with no pain. On the the second day the parts shrink, and the ligature becomes loose: its place should be supplied by another drawn rather more tightly. The application of this second ligature is generally rather more painful, from the increased sensibility of the parts consequent on the first operation. The swelling now soon loses its colour, and becomes livid and flaccid; and a third ligature entirely intercepts the circulation. The part usually falls off about the eighth or tenth day, and leaves a small ulcer, which soon closes under the application of dry lint. The umbilicus has acquired by this time such a firmness that it does not yield at all to the impulse occasioned by coughing, or any other exertion of the abdominal muscles. It is, however, advisable, as a matter of precaution, to continue the use of a circular bandage for the two or three months immediately following the cure, lest the salutary operations of nature, employed at this time in the gradual obliteration of the

umbilical opening, should be retarded by the pressure of the viscera against the parts.

“ We could recount a multitude of cases, in which the practice above detailed is confirmed by experience. But several have already been published in the *Surgical Journal*,* and an addition to their number would only lengthen these remarks unnecessarily. It is sufficient to state, that since the publication just alluded to, DESAULT has performed the operation in a vast number of instances with uniform success. Children were brought to him every week at the public theatre where he lectured, and had the ligature applied in the presence of the students; they were then taken home, and brought back daily to be dressed until the cure was complete.

“ It may still be doubted, says SABATIER, in quoting an article from the *Parisian Journal*, where DESAULT speaks on this subject, whether the children have been radically cured: the hernia may have returned at some future period. A multitude of facts may be adduced to dispel this suspicion: several patients were brought to the public consultation of DESAULT for other complaints, long after the period of the operation, and were found on examination to have the umbilical opening completely obliterated, and to be free from the slightest impulse of the viscera against the aperture, in consequence of coughing, sneezing, &c. Most of the surgeons of the *Hôtel Dieu* are acquainted with the patients radically cured by the operation of DESAULT; and I myself know two young persons operated on four years ago, and now entirely free from the complaint.

“ The event of this operation, which succeeds almost invariably in infants of an early age, becomes less certain in proportion as they grow older. This observation will be confirmed by the following cases:—

“ A child of eighteen months was brought to the clinical lecture of DESAULT, to undergo the operation for umbilical hernia, which was performed by means of the ligature, in the usual manner. The tumour fell off on the seventh day: and on the seventeenth the ulcer had cicatrized. At the expiration of six months this patient was brought again to the hospital, and was found by the pupils to have no trace remaining of its former complaint.

“ A boy four years old was operated on in the same way.

* There is an account of nine cases treated in this manner in the *Parisian Chirurgical Journal*, vol. ii. p. 189—199.

The separation took place on the eighth day ; and on the twentieth the parts had completely healed. An impulse of the viscera against the opening, which had not become entirely closed, could be perceived two months afterwards, in spite of the precaution of wearing a bandage, which had been observed constantly since the operation. At the end of the sixth month, however, this symptom had entirely disappeared.

“A girl of nine years old was brought from the country for an umbilical rupture, which had subsisted since the time of birth. DESAULT, whose opinion was asked on this case, advised the operation, which he had never hitherto practised at so advanced an age. It was performed with success, and the wound healed speedily : but two months afterwards the swelling began again to appear. A bandage was applied, but, in spite of this, the swelling in six months had become as it was originally.

“The latter fact appears to contradict the experience of CELSUS, who operated as late as the fourteenth year. It illustrates, however, the principle formerly laid down, that the disposition of the umbilical aperture to close, is lost after a certain period. In the three preceding cases the event seems to have been completely influenced by the age of the subjects. A perfect cure was effected at eighteen months ; it was obtained with difficulty at four years ; and a complete failure took place at nine. In several other instances, where operations have been performed at so late a period, the result has been the same.”

We cannot regard the preceding statement of the opinions and practice of DESAULT, as an impartial account of the result of general experience concerning the comparative merits of the different modes of treating umbilical ruptures. Having adopted and constantly employed the ligature, this great surgeon ascribes to it a safety and certainty of operation, which the experience of others has not confirmed ; and he has not fairly represented the advantages of compression.

“I have attended carefully,” says SCARPA, “to the phenomena and success of this operation, performed sometimes by means of the simple ligature, sometimes by passing it through the tumour ; and, after a very considerable number of practical observations, I feel myself authorised to say, that neither the one nor the other mode of operating is exempt from violent, and sometimes even dangerous symptoms ; and that neither of the operations produces a

truly radical cure, without the assistance of compression continued for several months after the wound is cicatrized. It is not so uncommon, as some surgeons have represented, for the operation to be followed by violent fever and very acute pain, which cause continual crying, and even convulsions. The separation of the slough is followed by an ulcer, large and difficult of cure, which becomes occasionally fungous and painful.” *

Sir A. COOPER also objects to the operation, on the ground of its painful and occasionally dangerous consequences.†

It has been asserted‡ that the complaint returned, even in many of the cases operated on by DESAULT, and supposed by him to have been radically cured; and hence, after the subject had been fully debated in the Medical Society of Paris, the general determination was, that the ligature ought to be abandoned.§

PROFESSOR BENEDICT, of Breslau, treated several cases of exomphalos with ligature, applying it according to the directions of DESAULT. He found it invariably produce symptoms so serious, if not dangerous, that he has abandoned the method. “In all the cases, pain in the abdomen came on about the third day, with great tenderness to the touch, especially near the navel, and considerable fever, so that the presence of peritoneal inflammation could not be mistaken: in one instance there was also vomiting. All the patients recovered under antiphlogistic treatment; but the symptoms were so formidable for two days, that a surgeon would not be justified in employing this treatment, unless all other measures had failed.”§

A case, which terminated fatally after the application of ligatures to an umbilical hernia of unusual magnitude, is related in the *American Journal of the Medical Sciences*.|| The subject was a female child, of seven years and a half, whose stature did not exceed that of a child three or four years old. The ineffectual trial of various instruments showed that the parts could not be retained in the abdomen, more especially as the mouth of the sac presented a diameter of three inches, and the enormous tumour ex-

* Mem. v. § 16.

† *On Crural and Umbilical Hernia*, p. 40.

‡ RICHERAND, *Nosographie chirurgicale*, tom. ii. p. 453; CARTIER, in the *Journal de Medecine*, tom. xli.

§ RUST, *Magazin für die gesammte Heilkunde*, vol. xlv. p. 176.

|| Vol. xvii. p. 368.

tended to the knees. The swelling measured, at the neck, twelve inches in circumference; six inches lower it was fifteen inches; it was seventeen inches in length. Two extensive ulcers existed on its posterior surface. It contained both intestine and omentum, and seemed to be completely reducible. The operation was performed in the following manner:—The patient having been placed on her back, the contents of the hernia were returned, and the sac was raised and twisted to insure the reduction. A flat buckskin ligature, three-fourths of an inch wide, was applied close to the abdomen, not so firmly as to strangulate the parts, but sufficiently to retain the viscera, and excite adhesive inflammation in the sac. A strong silk ligature was then applied with sufficient firmness to interrupt all circulation. When the mortified part was cut away, it was found that a portion of omentum had adhered to the sac, and of course had been included in the ligature. The patient died on the tenth day. The ring was perfectly closed by adhesion and granulation, which sprung from its tendinous margin; the colon adhered to the inner surface of the granulations; no inflammation could be detected in any part.

Compression is altogether free from the painful and dangerous consequences, that occasionally follow the use of the ligature; and has been found by RICHTER,* COOPER,† SCARPA,‡ and SOEEMMERRING,§ at least equally certain in its operation.

The situation of the swelling, and the age of the patient are unfavourable to the employment of elastic bandages. The surgeon should take a convex solid substance, adapted to the size of the opening. RICHTER particularly recommends half a nutmeg wrapped in linen; Sir A. COOPER a portion of ivory; and SOEEMMERRING a piece of cork;

* The grounds of this determination, alleged by the Society, are: "1. Parceque la guérison des hernies ombilicales s'opère très souvent, par les seules forces de la nature; 2. Parceque la compression seule, ou aidée des moyens toniques, réussit constamment; 3. Parceque cette opération mérite le triple reproche d'être douloureuse et non exempte de dangers, si l'on est assez malheureux pour comprendre une portion d'intestin dans la ligature; de ne pas réussir ordinairement, sans être aidée de la compression; et d'être parfois pratiquée inutilement, comme DESAULT lui-même en rapporte des exemples."—*Journal Gen. de Médecine*, tom. xli. p. 349, note.

† "J'ai vu beaucoup d'enfans attaqués d'exomphales, et je ne m'en rappelle pas un qui n'ait été guéri par l'usage du bandage: on ne peut point en dire autant des adultes."—*Traité des Hernies*, p. 236.

‡ *On Crural and Umbilical Hernia*, p. 40.

§ *Mem. v.*; § 15 & 16.

|| *Ueber die Nabel-Bruche*, § 72.

common wood will answer the purpose equally well. It will keep in place better if covered with wash-leather, or coarse linen neatly sewed on. When the viscera are carefully returned, let this body be placed over the opening, and be covered with a circular portion of sticking-plaster, over which strips may be applied crosswise, so as to bind it firmly in its place. The additional support of a circular belt is sometimes necessary. As this may be deranged by the motions of the child, it should be rather broader in front; and it may be either quilted, or strengthened with a piece of leather at this part, to prevent it from becoming wrinkled.

SOEMMERRING* has found the following method sufficient without any bandage or other addition. Sew a hemisphere of cork, covered with leather, and accommodated to the size of the umbilical aperture, in the centre of a piece of leather about three inches in diameter; and spread the rest of the leather with the most adhesive plaster. The parts being reduced, this plaster is to be applied, so that the cork shall press exactly on the opening. A spare one should be always ready in case of need. It will remain in its place, in quiet children, from eight to fourteen days; and will accomplish a cure, under favourable circumstances, in two months.

In proportion as the child is younger, so much the more speedily and certainly do these means produce a radical cure, which will be effected in two or three months, and sometimes in a shorter period. The chance of success is diminished according to the age of the child, and the duration of the complaint. If the treatment be not adopted at an early age, the complaint will probably continue through life.

When we are endeavouring to obtain a radical cure by means of compression, it is important that the parts should be kept constantly reduced; for if they are suffered to protrude at any time, the progress of the cure must be retarded. Hence, when a change of bandage or plaster is required, we should carefully prevent any protrusion by placing a finger on the part, and keeping it there until the applications are renewed. As the management of infants devolves entirely on females, the principles and object of the treatment should be clearly explained to the mother or

* Loco citato.

nurse, that they may know how to act in any emergency.

I have never seen an umbilical rupture strangulated in a young subject.

SECTION V. — UMBILICAL HERNIA IN THE ADULT.

AN umbilical hernia in the adult must be treated on the same principles as an inguinal or crural rupture.

Reducible exomphalos.—When reduction is attempted, the patient should be placed in the recumbent position, with the shoulders and pelvis a little elevated, and the thighs bent on the trunk, so as to relax the abdominal muscles. The circumstance of the opening being ordinarily at the upper part of the tumour must be borne in mind.

When the tumour is small in size and reducible, it may be kept up by means of a truss made like that for bubonocoele. The pad and neck of the truss should be continued in a straight line with the rest of the spring; and the latter part ought to extend beyond the spine.* When the patient is very fat, so that the navel is depressed, the concavity may be filled, according to the suggestion of Sir A. COOPER, with a hemisphere of ivory, or some other firm substance, on which the pad of the truss should rest.

Mr. HEY, of Leeds, describes a truss for the exomphalos and ventral hernia, invented by Mr. EAGLAND, surgical mechanic of that place, and recommends it to the public, on the ground of a four years' trial in various cases, having found it to sit easy upon infants as well as adults, and to answer its purpose more effectually than any other instrument. It is formed of two semicircular springs of cast-steel, well tempered and japanned. The posterior end of each semicircle is furnished with a quilted pad,

* RICHTER and SCARPA have found a truss of this kind to answer very well in umbilical ruptures. "En faisant à ce bandage (the common inguinal truss) un léger changement dans sa figure, on peut le rendre très propre à l'exomphale. Il faut donner à la pelotte une forme ovulaire ou même ronde, et ôter la courbure du col de manière que le ressort représente un demicercle élastique, et on obtient par ce moyen le meilleur bandage pour l'exomphale, que l'on puisse désirer: c'est le seul dont je me serve, et que je recommande, comme le plus sûr." RICHTER, p. 240. See also SCARPA, *Mem.* 5, § 17.

resting at the side of the spine ; and, when the instrument is put on, the two are united by a buckle and strap. The front end is fastened by a vertical brass hinge to a small plate of thin steel, which supports the pad pressing on the opening. The springs are covered in the usual manner. The steel plate is covered externally with morocco leather, and, on the inner side, with one thickness of doe leather, to which is firmly stitched a cushion of blanket and lining leather, containing a piece of cork of a proper shape and size. The pressure of the spring keeps this pad closely applied to the umbilical region ; while the hinges, which unite them to the steel plate, impart all the flexibility that is necessary for accommodation to the various motions and attitudes of the body.*

Sometimes the viscera cannot be kept in their place by any kind of truss that encircles the body ; or, at least, the patient cannot bear it, if applied with sufficient tightness to accomplish the purpose. This is likely to happen when the rupture is small, and the patient fat. I have found it more particularly in pregnant females, who are sometimes unable to bear circular pressure in any shape. Here we must have recourse to the plan already described as applicable to the *exomphalos* of young persons. That is, a firm substance of some kind must be placed in the opening, after the parts have been returned, and it must be securely fixed by adhesive plaster. If a broad elastic belt can be borne, it will give additional security.

Irreducible exomphalos.—If the hernia is irreducible, in place of the piece of cork, a concave plate of steel, adapted to the tumour, and lined with soft leather, should be substituted. It will protect the swelling, and prevent its further increase.

This plan is only applicable to an irreducible *exomphalos* of moderate size. If its magnitude be considerable, other means of supporting it must be resorted to ; such as suspending it over the shoulders by bandages passed under the swelling, or connected to a laced corset, fitting closely to the chest.

* Umbilical trusses of a more complicated construction have been devised ; one is described in the 2nd vol. of the *Mem. de l'Acad. de Chir.* by Mr. SURET ; and it was approved by the academy. JUVILLE has a similar one in his treatise. The object of both these is to admit of the truss enlarging and contracting according to the varying dimensions of the abdomen. RICHTER has rendered this truss more simple, p. 239. SCARPA has described several different trusses for umbilical herniæ. *Mem.* 5, § 17—20.

Rigorous attention to diet, and to the state of the intestinal functions, is indispensable in these cases. The food should be easily digestible, and taken in small quantity at a time ; and a daily evacuation of the bowels should be regularly procured. In this way we guard against flatulence and costiveness, which, by distending the belly, tend directly to augment the tumour. Of all ruptures the umbilical are the most frequently attended with indigestion, colic, flatulence, pain in the belly, &c.; and irreducible cases are still more subject than others to these intestinal disorders.

A case recorded by Sir A. COOPER shows that in persons afflicted with exomphalos indiscretions in diet may prove speedily fatal ; and it exemplifies the possibility of protruded intestine being ruptured by a fall. A woman, sixty years of age, had umbilical hernia for twenty years : it had attained a very large size, and for four years before death the skin had frequently ulcerated. It became strangulated soon after a hearty dinner of beans and bacon : there was excessive pain in the rupture and stomach, constant inclination to go to stool, and vomiting of everything swallowed. Medicine, clysters, and fomentations were employed ineffectually. In getting out of bed, on the 2nd day of the strangulation, she fell forwards on the floor ; her husband ran up stairs to help her, but she complained of violent pain, and refused to be removed from the place on which she was lying ; she was, therefore, covered with the bed-clothes and suffered to remain on the spot ; in a few minutes she died. The intestine contained in the tumour was burst in two places, so that the feces had escaped into the hernial sac, and in one part the inner coat of the intestine was burst without any rupture of the external peritoneal covering. There was no effusion into the abdomen ; the bowels were slightly inflamed, but extremely inflated.*

The treatment of an umbilical rupture, when strangulated, must be conducted on the principles laid down in the general observations on this subject. The surgeon should bear in mind, that the intestinal disorders, which occur so frequently in persons afflicted with this malady, particularly if it is old, large, and irreducible, are often severe, and assume an aspect more or less similar to that of strangulation. He must remember, also, that the immediate neigh-

* *Part ii.* ; Ed. 2. p. 36.

bourhood of the stomach, and its close connexion with the omental portion of the hernial contents, which is hardly ever wanting, expose that organ to irritation in various ways, and may produce nausea and vomiting, although there should be no pressure on the protruded parts.

In all cases where we see reason to suspect that constipation or intestinal disorder of any kind, rather than strangulation, is the source of the mischief, active purgatives in small bulk, will be most likely to afford relief. Calomel in doses of five or ten grains combined with opium, if the state of the stomach requires it, will answer our purpose best. It may be followed by small doses of Epsom salt at short intervals.

During the employment of these means, leeches, ice, or other cold applications to the tumour, if it be inflamed or painful, will mitigate the local disorder, and often produce much benefit.

If these internal and external means should not prove successful, the tobacco clyster still offers considerable chance of relief; in failure of which we must proceed to the operation. This, however, is undertaken with less prospect of success than in inguinal or crural herniæ. The greatest practical writers have strongly represented the frequent fatality of the operation for strangulated exomphalos; and the results of my own experience coincide entirely with their statements. I have, indeed, operated successfully on a large intestinal exomphalos, containing several convolutions of small intestine, of a bright red colour, without any omentum, in a fat woman advanced in years; but the majority of cases, in which I have either operated myself, or seen the operation done by others, have ended fatally.*

Perhaps this fatality may be in some degree explained by considering that the exomphalos is most frequent in fat gross subjects, unfavourable for operations; that general intestinal disorder either exists with the rupture, or is

* AMYAND has recorded two instances of exomphalos, with mortification of the intestine, followed by complete recovery. *Philos. Trans.* vol. xxxix, pp. 338, 341. Another may be seen in the *Journal de Med. Chir. &c. ou Recueil Periodique*, tom. vii. p. 53; and a fourth, in which an artificial anus remained, in the same work. PELLETAN operated in the case of a fat woman, with a very large exomphalos, and bad symptoms. The whole tumour was a collection of mortified parts and feces. The unloading of the alimentary canal from the operation produced great relief, and the woman recovered with an artificial anus in a short time. *Clin. Chirurg.* tom. iii. p. 90.

speedily produced by it ; and that irritation and inflammation are readily propagated to the stomach, which is close to the umbilicus.

The danger of the complaint, when the rupture is large, from the uncontrollable nature of the local changes, and their overwhelming influence on the constitution, is strikingly exemplified in the following case, which terminated fatally in seventeen hours and a-half, from the commencement of strangulation. A lady, forty-eight years of age, with a very large umbilical hernia, was seized with symptoms of strangulation on the twenty-first of August, 1806, at six in the afternoon. Purgative medicines and the tobacco clyster were employed ; after which, at ten o'clock, the swelling was so tender, the patient's cries were so violent when the swelling was touched, and she made such resistance to every attempt at reduction, that it was impossible to persevere sufficiently for a chance of success. She passed the night in dreadful agony, disturbing not only the persons in the house, but the neighbours, with her cries, and scarcely five minutes elapsed without vomiting. At half-past seven in the morning of the twenty-second, mortification had begun in the skin over the tumour, where the umbilicus had been originally placed ; the skin there seemed to be particularly thin ; it had changed to a green colour, but the cuticle had not separated. The symptoms remained the same, except that the cries were not so loud and piercing, as the powers were beginning to fail. Pain and vomiting continued ; delirium came on. At eleven, a large quantity of coffee-coloured fluid was rejected with a slight effort ; she then became extremely feeble, and expired at half-past eleven. The tumour contained a large portion of colon. Where the mortification of the skin had occurred, there was a little pouch protruding from the general cavity : it contained a portion of colon, which had become strangulated, and was more changed in colour than the rest of the intestine. Several small pouches had been formed in the sac, so as to make the tumour resemble a melon. The intestine adhered generally to the sac ; its large quantity, in conjunction with these adhesions, would have precluded all hope of benefit from an operation, if the hernial sac had been opened in the usual manner.*

It is possible that there may be a double umbilical hernia,

* SIR A. COOPER ; *Part ii.* Ed. 2. p. 37.

two sacs with separate openings being included in one swelling; or some portion of the parts contained in a large rupture may be strangulated within the tumour.

Sir A. COOPER relates the case of a lady, in whom an exomphalos occurred from a sudden effort during pregnancy, and continued in a reducible state, being supported by a truss; sixteen years after, a smaller swelling gradually formed at the left side of the former. Symptoms of strangulation occurred in this patient; the old and larger protrusion was easily replaced, but the smaller tumour remained, and the strangulation continued. The symptoms did not yield till the tobacco clyster had been employed, when the more recent protrusion was returned.*

The surgeon should remember, in performing this operation, that the coverings of the hernia are often thin, and that the integuments and sac are sometimes inseparably consolidated on the front of the swelling. His incision may extend longitudinally over the whole tumour, beginning half an inch or an inch above the opening in the linea alba; or it may resemble, in conformity with the advice of Sir A. COOPER, the letter T inverted; the longitudinal portion of the cut terminating on the middle of the swelling, and a transverse incision crossing the tumour at right angles with the former, so as to join its lower end. The stricture may be most conveniently removed by cutting upwards: no danger, indeed, can arise from giving the incision any other direction,† as there are no blood-vessels of any importance in the neighbourhood. The curved blunt-ended bistoury, carefully conducted by the left fore-finger, which should protect the protruded parts, may be employed for this purpose. The edges of the incision should be carefully brought together after the operation, and united by sutures.

The great fatality of the ordinary operation for exomphalos makes it advisable that we should employ every precaution calculated to diminish subsequent irritation and inflammation. Hence it would be proper to adopt, especially if the tumour exceeded a moderate size, the mode of operating which is applicable to large inguinal herniæ; in which the tendon is divided without opening the sac; or the latter part is only cut sufficiently to allow the division of the

* *Ibid.* p. 38.

† Some authors give directions for avoiding the umbilical vein; a caution, which is altogether superfluous.

stricture.* This will permit the return of the parts if they are not adherent; and if adhesions should have formed, the immediate cause of danger, the strangulation, is removed. The approximation of the sides of the wound by sutures, or adhesive plaster, will prevent the occurrence of inflammation in the tumour. The practicability of this mode of operating in umbilical ruptures is fully proved by two cases recorded in the work of Sir A. COOPER:† and the successful termination of both instances proved the judgment and sagacity which had suggested that peculiar treatment.

For the same reason, if we meet with intestine strongly adherent, we should be content to remove the stricture, and to cover the gut by drawing together the integuments over it.

A similar plan may be followed with adherent omentum. By leaving these preternaturally-connected parts in the wound, we avoid the irritation of a long and painful dissection; while the union of the integuments over them will probably obviate the occurrence of inflammation.

Strangulated umbilical hernia in pregnancy.—As the exomphalos occurs frequently in women, who are bearing children, we may expect to meet with it occasionally in the state of strangulation during pregnancy. Sir A. COOPER observes that this circumstance “appears not to add to the risk of the operation, when the constitution of the patient is otherwise good;” and he relates a case, in which the operation was successfully performed on a lady of forty, in the fifth month of utero-gestation by Mr. WALKER of Hurstpierpoint. It was an umbilical enterocele, which had existed in a reducible state for five years. The parts came down in the middle of the eighth pregnancy, and were returned on the 4th of February; they were again protruded on the 8th, and reduced after bleeding to 16 oz. They became completely strangulated on the next day, and the operation was performed on the 10th. The intestine was red, approaching to dark brown. Sixteen ounces of blood, which was sizzly and cupped, were taken away three hours after the operation. The patient was

* There can, I think, be no doubt, that in the unfortunate case of exomphalos, related in the chapter on omental ruptures (see p. 454), the patient would have had a much better chance of surviving, had the operation been performed in this manner.

† Part ii, p. 51 and 55.

much troubled with flatulence, and considerable difficulty was experienced in clearing the alimentary canal ; but she recovered quickly.*

The following case, in which I operated at a more advanced period of pregnancy, was attended with a termination equally favourable. I once operated, with completely successful result, on a crural hernia in the fifth month of utero-gestation : the circumstances are detailed in the chapter on omental ruptures.

CASE.—ELIZABETH MOORE, 31 years of age, a thin woman, has borne seven children, and is now in the seventh or eighth month of her eighth pregnancy. There has been a small swelling at the navel from her infancy ; and she has always worn a bandage till her present pregnancy : on former occasions the part has invariably swelled and become painful between the 4th and 5th month ; purgatives have always removed these symptoms until this time, when they entirely failed. On Sunday, September 30, 1827, she was attacked with severe pain in the umbilical region and with vomiting, for which she took pills and castor-oil without relief. She came into ST. BARTHOLOMEW'S hospital on the 1st of October, having then at the umbilicus a soft swelling, about two inches in diameter, with irregular surface : there could be no doubt that it was a rupture containing principally omentum.

The abdomen was neither tense nor painful. The pulse was frequent and hard ; there was thirst, with heat of skin, and occasional vomiting. Castor oil and clysters were employed without effect ; thirty leeches were applied to the abdomen. I saw the patient after the trial of these measures, and found the swelling soft and free from pain, the abdomen in the same state. The constipation and vomiting, however, showed that strangulation existed ; and a portion of bowel might be concealed under the mass of omentum, forming the principal bulk of the swelling. I therefore determined to operate immediately, considering the pregnancy, not as an objection, but rather an additional reason for rescuing the patient as quickly as possible from the imminent danger of her rupture. When the sac had been laid open by a perpendicular incision carried over the middle of the tumour, a large piece of omentum, and a small portion of discoloured intestine, were brought into

* Sir A. COOPER ; *Part ii.* Ed. 2. p. 47.

view. The latter was returned; a piece of omentum was cut off, and two arteries were tied; the edges of the wound were then united with sutures and sticking-plaster. The bowels were moved four or five times before night, during which she slept at intervals. Towards morning, (Oct. 2,) she complained of pain about the navel; there was a little redness round the wound, with tenderness. The tongue was coated; the pulse full and frequent. (Venesection to 16oz. Twenty-four leeches to the abdomen. One dram of Epsom salt in mint julep every three hours.) Oct. 3. A restless night; fever increased. (Venesection to 16oz.; twenty leeches to the abdomen. The Epsom salt to be taken every three hours in an effervescing draught. Bread poultice to the wound, which looks healthy.) 4th. A better night; fever diminished: the bowels open; tongue clean and moist. Pulse 112, and rather sharp. The wound is nearly healed, except at the upper part. (Venesection to 14oz., medicines continued.) 8th. Progressive improvement during the last few days. The tongue clean; pulse slow and soft. An abscess, which had formed on the tumour, was opened, and discharged a considerable quantity of pus. 19th. Continued improvement; meat diet. 26th. A truss was applied, and she left the hospital.

Mr. CLEMENT* operated on a strangulated femoral hernia in a female, aged thirty-six, who was then in the fourth month of pregnancy. The operation, performed about twelve hours after the accession of the symptoms, and the subsequent progress of the case, presented no peculiarities referable to the situation of the patient, who had perfectly recovered, so as to resume her ordinary avocations, in three weeks.

Mortified umbilical hernia.—The general principles already explained, in the chapter on mortified herniæ, are applicable to the treatment of an exomphalos, in which the intestine has become gangrenous. If the patient recovers after mortification of the whole intestinal diameter, an artificial anus remains. SCARPA explains this from the want of that process of peritoneum, which in inguinal and crural herniæ forms the connecting medium of the two ends of the gut, and constitutes his “membranous funnel.” In exomphalos the gut adheres to the edge of the opening nearly on a level with the skin, and the peritoneum cannot

* *Observations in surgery and pathology*; p. 123.

be drawn in towards the abdomen, as in inguinal or crural ruptures.

If however, a small opening only be made in the intestine, either by the gangrene of a portion of the diameter, or by ulceration produced by worms, or indigestible substances, the canal may be restored here just as well as in any other situation.

CHAPTER XVIII.

On Congenital Ruptures.*

SECTION I.—CONGENITAL HERNIA IN THE MALE SUBJECT.

THIS case differs from the common scrotal rupture merely in the circumstance of the protruded parts being contained in the tunica vaginalis testis, and consequently lying in contact with the testicle itself. The hernial sac is formed, therefore, by the vaginal coat of the testicle.

The differences between a congenital and an ordinary scrotal rupture are less important in practice than in pathology; for the symptoms and treatment are nearly the same in both species.

The fact of the viscera being occasionally found in contact with the testicle, was observed by surgeons long before the circumstances, leading to this peculiar modification of the complaint, had been investigated and explained. As the sac of the scrotal hernia lies in close contact with the tunica vaginalis, it was formerly supposed, that the pressure of the protruded parts might cause a preternatural com-

* The term *hernia congenita* was applied to this affection by HALLER (*de herniis congenitis*, Götting. 1749, 4to. *Opuscula patholog.* Lausan. 1754, 8vo.) and the name is sufficiently justifiable, if we consider that the state of parts favouring its occurrence exists at birth, although the rupture itself may not be formed till a subsequent period. From this Latin term the English epithet *congenital* has been derived. I cannot understand for what reason Mr. POTT and some others have exchanged this for the appellation *congenial*; which, according to its common use and acceptance, must be quite inapplicable to this or any other kind of rupture.

munication between the two cavities ; and thus the phenomenon in question was accounted for. The true nature of the complaint was ascertained about the middle of the last century ; when the labours of several celebrated surgeons and physiologists threw much light on the whole subject.*

It is now well understood that the testis is situated originally in the neighbourhood of the kidney, where it receives a covering from the peritoneum, in the same way as the other abdominal viscera derive their external investment ; that, in the latter months of uterogestation, it passes through the abdominal ring into the scrotum, carrying with it a portion of peritoneum ; that this peritoneal production, constituting the tunica vaginalis testis, is at that time a prolongation of the great bag of the peritoneum, analogous to the sac of a hernia, and opening like it into the abdomen ; that the communication between the membranous bag, holding the testis, and the abdominal cavity, is destroyed before the time of birth by the contraction and obliteration of that part of the peritoneal production, which is continued from the upper end of the testis to the ring ; and that the peritoneal coat, which surrounded the testis in the abdomen, gives the gland its external polished surface,

* See HALLER, *Programma, herniarum observationes aliquot continens*, Goetting. 1749 ; and in *opusc. patholog.* ; see also his *opera minora*, tom. iii. p. 311 et seq. ; POTT's *Account of a particular kind of Rupture, frequently attendant on new-born children, and sometimes met with in adults* ; London, 1765 ; CAMPER on the Causes of numerous Ruptures of newly-born children in the *Hailemische Abhandlungen*, vol. vi. p. 235, and vii. p. 58 ; HUNTER's *Medical Commentaries*, pt. i. Lond. 1762, cap. ix ; of the Rupture, in which the testis is in contact with the intestine, p. 70 ; and *Supplement to the first part of the Med. Com.* 1764, p. 6 ; CAMPERI, *icones herniarum*, tab. x. et xi. ; NEUBAUER *Dissert. de tunicis vaginalibus testis et funiculi spermatici*, Giessen, 1767 ; LOBSTEIN *de Herniâ Congenitâ, Dissertatio Anatomico-Chirurgica*, Argentorat. 1771 ; containing an excellent account of the subject, as well in an historical, as in an anatomical and surgical point of view ; GIRARDI in J. D. SANTORINI *tabulæ septendecim posthumæ*, p. 185 ; GIR. tab. ii. ; PALLETTA *nova gubernaculi testis Hunteriani et tunicæ vaginalis descriptio anatomica*, Mediolani, 1777 ; WRISBERG *Observat. Anat. de testiculorum ex abdomine in scrotum descensu ad illustrandam in Chirurgia de herniâ congenitis utriusque sexus doctrinam* ; in the *Commentationes reg. soc. scient. Götting.* 1778 ; and in WRISBERGII, *Commentationes*, vol. i. ; DE PANCERA *Diss. de testis humani in scrotum descensu*, Viennæ, 1778 ; BRUGNONI in *Mémoires de Turin*, 1784 and 1785 ; ROL. MARTIN *Commentarius de herniâ, sic dictæ congenitæ, ortu et sede, et de partium corporis fœtus, quæ ad ejus illustrationem pertinent, administratione anatomica* ; in *Nov. act. reg. soc. scient. Upsaliensis*, vol. iii. ; SANDIFORT, *icones herniæ congenitæ*, 4to. L. B. 1781 ; VICQ D'AZYR *Recherches sur la structure et la position des testicules*, in the *Mém. de l'acad. des sciences*, 780 ; LANGENBECK has more recently described and delineated the change of position, which the testicles experience, in his *Commentarius de peritonei structura, &c., c. tab. æn.* Goetting. 1817.

while the more loose process, that passes with it into the scrotum, forms the tunica vaginalis testis.

The numerous descriptions of the descent of the testis already published render it unnecessary for me to go over that ground again. I shall merely quote the observations of WRISBERG concerning the period at which this body changes its situation, and the varieties which occur in the process.

Before the beginning of the sixth month, the testis is always contained in the abdomen; and is generally near the kidney, but it may be behind the ring: this circumstance therefore affords a criterion respecting the age of a fetus.*

In his French translation of HUNTER's account, ARNAUD mentions that Mr. HUNTER had met with a fetus of six months, in which one testis had passed completely into the scrotum;† and WRISBERG himself, on a subsequent occasion, states that he had found both testes in the scrotum in an embryo of four, and in another of five months.‡

The scrotum during this time is very small: and contains nothing but a soft cellular tissue, together with the termination of the fibrous cord constituting the gubernaculum testis.

In the interval, between the beginning of the sixth and the end of the seventh month, it may be seen above the ring, or in its passage through the opening, or just below it. When it has passed the tendon of the external oblique, it may still at first be pushed back into the abdomen, as the opening of communication is not yet closed. Occasionally this may be done even for some time after birth. In the eighth month these organs have generally passed the ring, but have not descended into the scrotum; the tunica vaginalis communicating with the abdomen, or the intermediate canal being closed. Ordinarily both testes have arrived at the bottom of the scrotum in the ninth month, and the communication has closed; but it may be open on one or both sides.

Of one hundred and three children, which WRISBERG carefully examined for this purpose at the time of birth, seventy-three had both testicles in the scrotum: in twenty-

* The situation of the testis near the kidney is represented by WRISBERG, *Descript anat. Embryon.* fig. 4 and by GIRARDI in SANTORINI, *tab.* see GIRARDI, *tab.* ii. fig. 2.

† *Mem. de Chirurgie*, tom. i. note to p. 25.

‡ LODER'S *Journal für die Chirurgie*, B. i. St. ii. p. 175.

one, one or both were in the groin ; of these, five had both, seven the right, and nine the left, in the groin : in twelve, four had both, three the right, and five the left, only in the abdomen.

In one of the last division, the descent took place on the day of birth, in three on the second day, in three on the third, in two on the fifth, and in one on the twenty-first day : in the remaining three the testes had not appeared at the fourth or fifth week, when the infants left the hospital. In two there was hernia on the right side.*

If the communication between the tunica vaginalis and the peritoneum should not be obliterated, the parts remain just as they were immediately after the testis had passed into the scrotum. Instead of lining the abdomen smoothly in the inguinal region, the peritoneum exhibits a small aperture, the commencement of a membranous canal, which leads in front of the spermatic cord into the tunica vaginalis testis.

It should appear, by the observations of CAMPER, that the canal of communication is generally open at the time of birth. He dissected seventeen newly-born children for the purpose of ascertaining this point. He found the canal open on both sides in eleven of these ; it was obliterated entirely on one side, and only in part on the opposite, in five ; and in one only it was completely closed on both sides.† My own observations do not agree with this statement ; I have generally found the canal closed at the time of birth. CAMPER asserts further, that the canal is closed earlier on the left than on the right side, and explains, from this circumstance, the more frequent occurrence of herniæ on the latter side.

The membrane forming this tunic, instead of terminating at the upper end of the gland, as it usually does, is continuous, by the membranous canal just mentioned, with the peritoneum. Such an arrangement of parts, presenting a sac ready formed for receiving any protrusion of the viscera, renders the occurrence of a hernia probable. The parts are propelled, along the membranous canal in

* *Commentat. soc. reg. Scient.* Gotting. 1778 ; or *Commentat. Anat. Med. Physiol.*, &c. vol. i.

† *On the causes of the ruptures which occur so frequently in new-born children*," in the *Transactions of the Dutch Society of Sciences at Haarlem*, vol. vi. and vii. ; in Dutch. These papers are also contained in his *Dissertationes edit. a HERBELL*, 8vo. Lingæ, 1800.

front of the cord, into the tunica vaginalis testis; and the complaint assumes, under these circumstances, the peculiarities which constitute a congenital rupture. It is still necessary that the causes, which give rise to herniæ, should act in this case as well as in any other; since the mere existence of the communication is not sufficient for the production of a congenital rupture. In quadrupeds the tunica vaginalis communicates with the abdomen, and yet protrusions of the viscera are rare.* In like manner the canal sometimes remains open in the human subject, to even the adult age, without the formation of rupture.† The term *congenital* therefore is not applicable to this hernia in its strict sense, as it does not usually exist at the time of birth: generally it appears soon after this period, but its occurrence may be delayed, even for many years.‡

An accidental circumstance may give rise to the complaint, where it is strictly congenital. WRISBERG observed a small prominent fold of the peritoneum, continued from the upper end of the testis to the end of the ileum or the cæcum, in some subjects, and forming a preternatural connexion between these parts. The change of situation in the testis would be probably attended, in such a case, with a descent of the connected intestine. An adhesion of the omentum or intestine to the testicle in the abdomen may cause these parts to pass through the ring, when the testis itself descends, or may even retard, or totally prevent the descent. In an infant, which had only one testicle in the scrotum, and died a few hours after birth, WRISBERG § found the opposite one close to the ring, and connected to the omentum by means of three slender filaments. In two con-

* WRISBERG saw a scrotal hernia in a horse; and observes that monkeys have been affected in the same way.

† HESSELBACH found the processus vaginalis peritonei open on both sides, in a man thirty-eight years old, in whom no protrusion of the abdominal contents had occurred. *Med. Chir. Zeitung*, 1819, p. 110. See also the observations of M. CLOQUET, quoted at p. 196.

In a case, mentioned at p. 284, a rupture, which had occurred suddenly at the age of twenty-four, from a violent exertion, proved to be congenital. Another instance, in which the parts first descended at the age of twelve, is related at p. 574.

M. VELPEAU mentions four or five cases of congenital inguinal hernia, in which the first descent occurred at various ages, from eighteen to twenty-one. *Nouveaux Eléments de méd. opérat.*, tom. ii. p. 459.

‡ “Rarissimè, si unquam, talis hernia in recens natis jam adest, sed testem serius protrusum aut presso pede sequitur, aut accidente aliquâ causâ occasionali, contenta post menses vel annos in saccum haud occlusum propelluntur.”—CALLISEN, *pars poster.* p. 494.

§ *Comment. reg. soc. scient.* Goetting. 1778, p. 71.

genital herniæ, which existed at the time of birth, when the contents were returned, the testis was drawn up towards the ring.* The same author also found the omentum adhering firmly to the testis, in a case which he examined in the adult, although there was no adhesion to any other part.† In a child, born with a hernia on the right side of the scrotum, and who died three months after birth, the protruded parts were cæcum, with its appendix vermiformis, and the extremity of the ileum. The appendix adhered firmly to the testis and to the sac.‡ It was a preternatural connexion of the omentum to the testicle, by a single thread, that rendered the rupture of the celebrated ZIMMERMAN irreducible, and caused various troublesome and painful symptoms, which induced him to submit to the operation. § SOEMMERRING || found the appendix vermiformis adhering to the testicle. In a case of congenital hernia figured in the *Commentarius* of LANGENBECK (tab. x.) the intestine adheres to the testicle, but to no other part. Indeed the experience of most individuals must have furnished opportunities of observing how frequently the viscera are connected to the testis in congenital ruptures. I shall therefore content myself with referring on this point to the opinion of Mr. POTT; who not only states in general terms that adhesions are much more frequent in this than in other ruptures, but particularly notices the strength of the connexion, which frequently subsists between the prolapsed viscera and the testis, and the difficulty which is experienced in destroying it.¶

Adhesions between the testicle and the neighbouring viscera, instead of causing congenital hernia, may prevent the descent of the testis. In the body of a very old man, M. J. CLOQUET found the left side of the scrotum empty, and an elongated substance of roundish form, like the spermatic cord, below the ring. The testicle was placed between the psoas and iliac muscles, an inch above the upper opening of the inguinal canal, and was of the same size as the opposite one, which had descended into the scrotum. The epididymis held its proper relative position to the tes-

* *Comment. reg. soc. scient.* Goetting. 1778, p. 43, 44.

† *Ibid.* p. 71. A similar case is mentioned by PELLETAN, *Clin. Chirurg.* tom. iii. p. 332.

‡ *Icones herniæ congenitæ.*

§ MECKEL *de Morbo Hernioso congenito singulari*, &c. Berolini, 1772.

|| DANZ *Zergliederungskunde des ungeborenen Kindes*, vol. ii. p. 164.

¶ *Works*, vol. ii. p. 162; and vol. iii. p. 292 and 299.

ticle, and was of the normal size. Its upper end was connected to the sigmoid flexure of the colon by a strong, short and rounded fibrous cord; from its lower extremity arose the vas deferens, which took its usual course into the pelvis. Although the descent of the testicle had been thus prevented, the gubernaculum had drawn out of the abdomen a portion of peritoneum, which would have formed the tunica vaginalis, if the testicle had descended. It now constituted a serous pyriform bag, three inches long, adhering behind to the gubernaculum, and in front to some fibres of the internal oblique muscle, which formed an imperfect kind of cremaster. The communication of this bag with the cavity of the abdomen had become closed, the point where it had formerly existed being marked by small radiated folds. This closed serous sac was the part which had been felt below the ring of the external oblique.*

Adhesion of the testicle to the abdominal viscera is not the only cause capable of impeding its descent; at least we find that its change of situation is not accomplished in the regular way in some cases, although it may be perfectly unadherent. We find it in the inguinal canal, or near the upper or lower opening of that passage. In the case of inguinal hernia related at p. 272, I have stated that the lower extremity of the testis lay just in the upper opening of the ring. The gland in this case was not more than half its usual size; the epididymis, which was very imperfect, ran for about an inch along the back of the hernial sac, and did not appear to join the testis. Another case of hernia, which I had the opportunity of examining through the kindness of my friend the late Mr. CROWTHER, presented similar appearances, namely, an imperfect testis just within the ring, and an apparently incomplete epididymis, which ran down behind the hernial sac. Both the preparations are preserved in the museum of ST. BARTHOLOMEW'S Hospital.

M. J. CLOQUET met with a similar state of parts in a congenital inguinal hernia, in a subject forty years of age. A soft doughy swelling, of elongated figure, descended to the middle of the scrotum: the protruded parts could be returned easily, and the testicle could not be distinguished. When the integuments and the fascia superficialis had been turned aside, the hernial sac, consisting of a thin membrane like the tunica vaginalis, was exposed: it descended

* *Recherches sur les causes, &c.* p. 24; pl. v. fig. 2.

two inches and a half below the inguinal canal; it was covered by thin whitish fibres belonging to the cremaster; it contained unadherent omentum, and had no fibrous ring at its mouth. The testicle, flattened, elongated, and in a state of atrophy, was contained in the inguinal canal, and projected into the hernial sac: it was so small, that it could not be felt externally. The epididymis, partially unravelled, was found an inch below the testicle, and closely adherent to the hernial sac. It communicated with the testicle by whitish, transparent, and very slender vessels running parallel to each other. It descended to the lower part of the sac, then ascended along its inner side to give origin to the vas deferens, which entered the inguinal canal to join the spermatic vessels. The epididymis was connected below to a triangular, whitish, fibro-cellular cord, which was attached to the scrotum and ischium. This was the remains of the gubernaculum: it fixed the sac below, and prevented its return.*

The variations, which occur in the descent of the testis, lead to considerable differences in the circumstances under which inguinal herniæ are presented to our notice. A rupture may occur while the testis is still in the abdomen; and it may be either complete or incomplete. The cases just related exemplify the former; an instance of the latter kind is seen in the following account quoted from SCARPA.

“C. M. BIFOLCO, twenty-five years of age, was attacked on the 20th of June, 1816, with severe pain in the belly, nausea and vomiting, and, under the effects of the latter, perceived for the first time a small oblong tumour in the groin, painful to the touch. This swelling disappeared under the pressure employed by the surgeon, who considered the case to be a rupture. The symptoms, however, continued, and the patient was sent to the hospital, when the disease, considered to be colic, was treated by venesection and purgatives, under which the pain and vomiting increased, with

* *Recherches sur les causes et l'Anat., &c.* p. 23; pl. vii. fig. 2 and 3.

In the instance of C. M. BIFOLCO, quoted from SCARPA in this page, a small testicle was found within the ring. These cases corroborate the opinion of Mr. HUNTER concerning the cause of the testicles not quitting the abdomen in certain cases. He says upon this subject, “I am inclined to suspect that the fault originates in the testicles themselves.” And again, “When both testicles remain through life in the belly, I believe that they are exceedingly imperfect, and incapable of performing the natural functions of those organs; and this imperfection prevents the disposition for their descent from taking place.”—*Remarks on the Animal Economy*, pp. 16 and 18.

cold sweat and deathly paleness. The young surgeon in charge of the ward, suspecting that there must be a strangulated rupture, examined the patient very carefully, and found in the right groin, between the ring and the side, a small oblong painful tumour, which seemed to enlarge under the efforts of coughing and vomiting. The operation was unfortunately postponed, and the patient died. When the integuments of the groin had been turned back, it was found that the aponeurosis of the obliquus externus constituted the external covering of the swelling. On dividing this, the hernial sac was seen formed by the tunica vaginalis testis, and containing a portion of the ileum near to its junction with the colon. The stricture was in the superior aperture of the inguinal canal. The testicle, small and rather hard, was just above the canal, in which situation I have found it in all cases of this description; having seen many of them, and operated successfully on several."*

A congenital rupture may exist when the testicle has but just passed the ring; and the gland may then interfere with the measures necessary for returning or keeping up the rupture. A rupture may pass into the scrotum, while the testis is at the ring: or both may descend together.† Lastly, the testis may present occasionally at the opening, when a rupture has formed, and cause unpleasant symptoms from the pressure which it experiences. "I remember," says RICHTER, "a young man, twenty years of age, who had a small hernia, and no testicle on the left side of the scrotum. The testicle was contained in the abdomen, and sometimes presented at the ring, causing violent pain and symptoms of strangulation, which rendered it necessary to push the gland back again. This object, however, could seldom be accomplished until more than twenty-four hours had elapsed, and emollient cataplasms had been employed. The symptoms immediately ceased when the return of the testis was effected."

The anatomy of congenital hernia is nearly the same with that of the first species of bubonocoele, excepting the circumstance of the testis being contained in the same membranous cavity with the protruded viscera. It is, however, rightly observed by SCARPA, that the sac consisting of the

* *Sull'Ernie*, edit. 2. p. 15.

† REICHEL *de descensu testiculi in puero, cum hern. incarceration. lethali*; in LUDWIG *Advers.* vol. iii. p. 731.

tunica vaginalis, which is inseparably attached to the testicle and front of the spermatic vessels, cannot be detached from them, so as to admit of being turned up towards the abdomen as in the common external inguinal hernia. He states further, that the cellular texture between the sheath of the cremaster and the tunica vaginalis is less abundant and soft; so that the cremaster is not so easily separated from the sac in congenital as in common inguinal ruptures; also that the proper serous sac is thinner in the former than in the latter case.

The symptoms and treatment of this rupture are the same as those of other inguinal herniæ.

It may be distinguished from common scrotal hernia by the impossibility of feeling the testicle, which part can be clearly felt in those cases. The existence of a rupture from infancy affords a strong suspicion that it is of this kind. And we have great reason to conclude that a scrotal hernia in a child is congenital, although the cases related in the fourth chapter of this book, show that the rule does not hold good invariably.*

A congenital epiplocele may be mistaken for a diseased testis; the history of the complaint will lead to the proper discrimination.

Fluid may be collected in the tunica vaginalis while its cavity still communicates with the abdomen; and it may form there during the use of a truss for a congenital hernia. As the contents of the tumour pass into the belly on pressure, such a case may be confounded with hernia. The fluid comes down again into the scrotum, when the pressure is removed, although the patient makes no exertion; and this, together with the fluctuation and transparency of the swelling, are sufficient for the purpose of discrimination. The fluid will generally be absorbed in young subjects.

As there is always a disposition in the membranous canal, which connects the tunica vaginalis to the abdomen, to contract and close, this effect will probably take place in young subjects, if the viscera be replaced, and maintained in their natural situation by means of a proper truss. A radical cure of the complaint will thus be effected in a short time. The same event cannot be looked for at a more advanced age, where the employment of a

* See page 79.

truss, as in other species of the complaint, must be regarded merely as a palliative measure.

Before the surgeon applies a truss for an inguinal or scrotal rupture in a young person, he must satisfy himself not only that the protruded parts are fairly replaced, but that the testicle has reached its normal situation in the scrotum. A rupture may take place in an infant when this gland has not yet quitted the abdomen. I have already mentioned cases of scrotal hernia, in which the testis on the affected side had never passed the ring.* Mr. POTT† and HALLER‡ have furnished us with similar instances. The application of a truss to a young subject, thus circumstanced, might prove injurious by retarding the descent of the testis. If it should have arrived only so far as the groin, the pressure of the pad on the gland may be attended with still worse effects.

In the operation for congenital hernia, the sac should not be divided further than the upper end of the testis; a sufficient portion of the tunica vaginalis to cover that organ being left unopened. The incision may extend lower, if adhesions exist.

The stricture is frequently formed by the hernial sac, not only where it communicates with the abdominal cavity, but also in other situations, where we might not have expected this occurrence. Mr. WILMER§ informs us that in these ruptures he has generally found the stricture in the neck of the sac, and not in the tendon of the external oblique; and Mr. POTT|| mentions an instance of remarkable narrowness in the upper part of the sac. In two cases of congenital hernia, recorded by RUDTORFFER, the ring of the external oblique made no pressure, and the stricture was caused entirely by the neck of the sac. In one of these he was obliged to prolong the incision of the skin upwards, and even to slit up the tendon of the external oblique, in order to reach the stricture.¶

Mr. POTT has seen and recorded many cases where the

* See p. 569.

† *Account of a particular Species of Rupture*, &c. p. 34.

‡ *Opera Minora*, vol. iii. p. 318.

§ *Pract. Obs.* p. 10: and Mr. ALANSON states, that nearly all the cases he has seen of stricture in the neck of the sac have been congenital herniæ. *Ibid.* p. 96.

|| *Works*, vol. iii. p. 299.

¶ *Abhandlung*, &c. in LANGENBECK, *Biblioth.* i. 983 and 988.

hernial sac was contracted lower down, so as to embrace the protruded parts with great tightness. The intestine has been so closely girt by this kind of stricture after death, that it could not be withdrawn without laceration: and the omentum, from the same cause, has been converted into a firm hard substance, while above and below the contracted part it still retained its normal structure.* WRISBERG † noticed the same circumstance in a patient whom he examined. There were two contractions of the hernial sac; and the narrowest of these, forming a hard tendinous and callous ring, was in the situation where the tunica vaginalis testis ordinarily terminates just above the testis; ‡ the other, similar in structure and appearance, formed the opening of communication with the abdomen. He ascribes the constriction to the partial accomplishment of the natural process of obliteration. SCARPA § met with contraction in the body of the sac in two congenital herniæ, on which he operated; and PELLETAN || twice saw a narrow round hole, forming the communication between the hernial sac and the tunica vaginalis, and completely filled by the omentum, which had descended into the latter.

CASE. — HEWER, aged twenty-four, the son of a farmer in Gloucestershire, had been occasionally troubled with a descent of the intestine into the scrotum, since the age of twelve years. Although it appeared afterwards that this rupture was of the congenital kind, it did not take place until the above-mentioned age, and had descended only a few times.

The parts came down whilst he was riding, on Monday, September 15, 1807, and the symptoms of incarceration came on rapidly. The most active means were resorted to without delay. Large bleeding from the arm and cold applications to the part produced no benefit; and the free use of tobacco, both in the form of smoke and infusion, was equally inefficacious. The latter remedy was employed until its full effect was exerted on the system, as appeared

* *Works*, vol. ii. p. 161; vol. iii. p. 293, et seq.

† *Lib. citat.* p. 69 et 70.

‡ LE CAT found, on dissection, a complete strangulation through such an aperture. The patient died from this cause; while the free state of the ring, together with the entire absence of pain and tension from the upper part of the tumour, led the surgeon to conclude that the swelling had no connexion with the symptoms. *Philos. Trans.* vol. lvii.

§ *Mem. i.* § x.

|| *Clinique Chirurg.* tom. iii. pp. 108 and 335.

by a considerable reduction in the strength and number of the pulse, cold sweat, pallid countenance, great feeling of anxiety and distress, and a state of faintness approaching to syncope. It is by these symptoms, and not by the length of time, nor by the quantity of the remedy consumed, that we can judge whether a fair chance is afforded to the patient of benefiting by the use of tobacco.

The operation was performed on the evening of Wednesday, September 17. About half way between the testis and groin, the hernial sac was so contracted, that a probe only would pass into the stricture; and the prolapsed parts experienced, in this situation, as close a constriction as that which they suffered from the margin of the ring. This unexpected circumstance was at first rather embarrassing; for, as the upper division of the sac was first opened, and the communication, in consequence of the closeness of the contraction, could not be immediately discovered, a doubt arose as to the nature of the lower part of the swelling.

When the hernial sac was completely laid open, a fold of intestine was found in contact with the testis, and covered by a portion of omentum. Both these parts were of a reddish brown colour. The stricture, which was formed at the upper opening of the ring, would not admit the smallest portion of the tip of the finger, so that I found it necessary to employ the grooved director and curved knife for its enlargement. The intestine, which was marked by a strong impression from the situation of the stricture, was then returned with ease; and the omentum was cut off on a level with the ring, its divided margin affording no hemorrhage; the latter part was immediately retracted within the abdomen.

A common clyster was injected, and small quantities of a solution of Epsom salt in mint water were repeatedly exhibited during the night; but no discharge from the bowels took place till the following day, when the patient was much relieved by copious evacuations. His recovery proceeded most favourably. A single venesection, with fomentations to the abdomen, was sufficient to remove slight inflammatory symptoms. A light and sparing diet was rigorously enforced; and no other medical assistance was required, excepting the use of the saline effervescing draughts, with occasional doses of opening medicine. The abdomen continued perfectly soft and free from tension, except just above the wound; here it was rather hard,

and pressure excited slight pain, for which leeches were twice applied with benefit.

He was so completely recovered by the 2nd of October, as to bear being removed to his own home, which was several miles distant from the place where he had been taken ill.

As the parts, in a case of congenital hernia, are always protruded on the outside of the epigastric artery, the stricture may be safely divided either towards the ilium, or directly upwards.

SECTION II.

Case in which the protruded parts, together with the sac, are contained in the tunica vaginalis testis: Hernia Infantilis, HEY; Encysted hernia of the tunica vaginalis, SIR A. COOPER.

A species of congenital inguinal hernia, which has been observed in a few instances, might considerably perplex an operator, unless he were previously aware of the peculiarities which characterise it. In the case, to which I now allude, the protruded viscera, surrounded by their hernial sac, are contained in the tunica vaginalis testis. The rupture therefore must be formed, when the communication of the tunica vaginalis with the abdominal cavity has been interrupted by a closure of the membranous tube at its upper part, and while the serous cavity still continues open from the abdominal ring downwards. Presuming that such a state of things is peculiar to early infancy, Mr. HEY proposed to call this form of the complaint *hernia infantilis*.

It was first described by this excellent surgeon, who met with it in 1764, in examining the body of a child, fifteen months old, who had died of strangulated scrotal rupture; the existence of the complaint having been first noticed at the age of two months. Having exposed the tumour, Mr. HEY opened what he supposed to be the hernial sac, but it proved to be the tunica vaginalis testis, containing, together with the testicle, a portion of the true hernial sac. He says, "This unusual appearance engaged me to prosecute the dissection with great care. I found that the tunica vaginalis was continued up to the abdominal ring, and inclos-

ed the hernial sac ; adhering to that sac, by a loose cellular substance, from the ring to within half an inch of its inferior extremity. The fibres of the cremaster muscle were evident upon the outside of the exterior sac, or tunica vaginalis. The interior or true hernial sac was a production of the peritoneum as usual, and contained only the cæcum or head of the colon.”—“ Having removed the proper hernial sac, I examined the posterior part of the exterior sac ; and found it connected with the spermatic vessels in the same manner as the tunica vaginalis is, when the testis has descended into the scrotum : an additional proof that the exterior sac was the tunica vaginalis.” *

A case of the same kind came under the care of Mr. FOSTER at GUY’S Hospital, in 1801. The patient, thirty-one years of age, had been seized during a fit of coughing with acute pain in the groin thirty-six hours before his admission into the hospital : a small tumour was found just below the abdominal ring, extending about three inches into the scrotum. He refused to undergo the operation, and consequently died : the parts were examined. “ When the scrotum was divided, the tumour was brought in view, taking the course of the spermatic cord, evidently involved with it, and much contracted at the ring. On investigating further, and cutting carefully through the tunica vaginalis of the cord near the ring, a fluid escaped. I then continued the incision to the bottom of the scrotum, through the tunica vaginalis of the cord, and the tunica vaginalis testis, which I now found to be one cavity, the edges of which being turned back on either side, exposed a hernial sac pendent from the ring, and descending towards the testicle.” *

SIR ASTLEY COOPER adds, that since the first edition of his work, two similar cases have been seen in GUY’S Hospital : one was the subject of operation on account of strangulation ; the other was accidentally met with in dissection, and is preserved in the Museum. The case of the patient, who underwent operation, is subjoined : he was

* HEY’S *Practical Observations in Surgery*, ed. 3. *An account of an uncommon species of Scrotal Hernia*, p. 226—231. It was first published in Gooch’s *Works*, vol. ii. p. 217.

† SIR A. COOPER, *part i.* ed. 2. p. 80. Fig. 1 and 2 of Pl. xi. are two representations of the parts ; the former, with the sac entire, as exposed by laying open the tunica vaginalis ; the latter, with the sac opened so as to expose the strangulated intestine.

twenty-nine years of age, had been afflicted with rupture all his life, and had worn a truss for twelve years. When the tunica vaginalis had been divided, a tumour with a smooth covering was exposed : this consisted of about nine inches of small intestine, covered by a membrane so thin that the colour of the bowel was seen through it. The operation was successful.*

Sir A. COOPER relates another case, in which the rupture seems to have been of this kind. It was in a man thirty-seven years old, who had laboured under the complaint twenty years : he ascribed it to the kick of a horse. The operation was performed, but death ensued. No light was thrown on the peculiarities of this rupture by the examination after death. †

SECTION III.—CONGENITAL HERNIA IN THE FEMALE.

The distinction of this rupture in the female is of still less practical importance than in the male subject. Indeed, there are no marks by which it could be ascertained ; nor would its treatment differ in the least, if that distinction could be made.

NUCK ‡ first pointed out a small production of peritoneum continued through the abdominal ring over the round ligament of the uterus, and terminating by a blind extremity at the groin. He called it a diverticulum ; and described it as being about half an inch in length, and by no means constant. The same circumstances have been subsequently observed by others. CAMPER § saw these diverticula in three out of fourteen newly-born children ; and LE CAT || observed, in a woman of forty-six, a canal of the size of a goose-quill, leading through the ring into a small cavity that would admit the finger. WRISBERG ¶ has particularly investigated the subject. In nineteen out of two hundred female bodies, he found an opening, generally on both sides, but sometimes on one only, leading through the ring into the groin or labium, lined by peritoneum, placed

* *Ibid.*

† *Ibid.* p. 75—77.

‡ *Adenographia Curiosa*, cap. x, “*de peritonæi diverticulis novis*, fig. 35. 39. 40.

§ *Haarlem Transactions*, vol. vi. and vii.

|| *Philos. Transact.* vol. xlvii.

¶ *De testiculorum descensu*, &c. § 34, in his *Commentationes Med. Physiol.* &c. vol. i. p. 234.

over the round ligament, and terminated by an obtuse extremity. These canals in different instances would admit a probe, a quill, or the finger. In two cases of ascites, Mr. A. BURNS found this canal so much enlarged, as to admit the introduction of the thumb.*

M. J. CLOQUET, who has made similar observations, represents that the membranous productions in these cases adhere closely to the round ligament; and that they are met with in fœtuses, in young girls, and in women of all ages.†

Mr. BURNS ‡ says, that he had met with seven cases of congenital hernia in the female, in six of which the anterior side of the inguinal canal was deficient, so that the parts descended into the bend of the thigh and occupied the situation of crural hernia: (see p. 241.) In one instance the sac did not pass through the lower opening of the canal. Mr. BURNS does not mention the diagnostic signs which led him to consider these cases congenital. He sent to Sir A. COOPER the description of a case, in which there were four herniæ, two crural, and two inguinal, the latter being of the congenital species. He says, respecting the latter, that “on both sides the inguinal canal was fully as large as it is usually met with in the male, and beside was so very short, that it presented when dissected almost the appearance of a mere aperture. The round ligament of the womb was enveloped in a distinct tunica vaginalis, and in this the gut lay, the ligament bearing the same relation to the intestine that the spermatic cord does in the other sex. On the right side the herniary sac was about two inches in length, and in shape resembled a Florence flask; the bulbous extremity, expanding from the lower orifice of the canal, was contained in the upper part of the thigh, lying more in the course of crural than of inguinal hernia.”§

It has not been ascertained that these diverticula become closed, as the communication between the tunica vaginalis and the abdomen does. Nor have we reason to believe that their presence favours the occurrence of ruptures.

* MONRO *on the Morbid Anatomy of the Gullet, &c.* p. 514.

† *Ibid.*

‡ *Recherches Anat.* p. 41.

§ COOPER, *Part i.* p. 81, 2.

CHAPTER XIX.

ON VENTRAL RUPTURES.

Their Seat and Symptoms.

THE epithet *ventral* is applied to all those ruptures, which, appearing at the front or sides of the belly, are not protruded through the umbilicus, the abdominal, or the femoral ring. They come through openings in the abdominal muscles or their aponeuroses; and there is hardly any part of these, at which they may not take place. They are much less common than the species hitherto described. Their most frequent seat is at the interval between the two recti abdominis above the navel: they have been seen in this situation from the size of an olive to that of the fist, or even of a man's head. * The smaller ones occur in the scrobiculus cordis, at the side of the ensiform cartilage, and have been called by the French † *herniæ of the stomach*, from a notion that they contain a portion of that viscus. Although their symptoms are such as denote ordinarily stomachic affection, I believe that no part of the organ has ever been seen in one of these ruptures: the vicinity of the stomach will easily account for the disturbance which it experiences in such cases. LA PEYRONIE ‡ found a portion of the colon in a small ventral hernia which had caused, during life, the symptoms ascribed to herniæ of the stomach. LITTRE § found the same intestine in a rupture situated three fingers' breadth above the navel. It seems more probable that this bowel should be protruded

* RANBY in the *Philosophical Transactions*, 1731, No. 421.

† GARENGEOT, *Mémoire sur plusieurs hernies singulières*; *Mém. de l'Acad. de Chir.* tom. i. p. 702, et suiv. PIPELET, *Nouvelles observations sur les hernies de la vessie et de l'estomac*, *ibid.* tom. iv. p. 188, et suiv.

‡ *Mém. de l'Acad. de Chir.* tom. iv. p. 198.

§ *Sur une hernie rare*, in the *Mém. de l'Acad. des Sciences*, 1714.

in such cases, than the stomach. These ruptures are sometimes so small,* as to occasion no perceptible external tumour; but they may equal the fist in bulk.

Without being strangulated, they cause various symptoms, which are often referred to other sources, and can be cured only by discovering the true nature of the complaint. This will probably be accomplished by observing the inexplicable obstinacy of the symptoms, and attending to the rule of examining carefully all the ordinary seats of herniæ in those affections, in which the stomach and bowels are implicated. The pressure and irritation experienced by the protruded part must be regarded as the cause of the symptoms. The patient feels a pain and dragging at the stomach; and the epigastric region is sometimes so sore, that even the pressure of the clothes is painful. Digestion is disturbed; and to such a degree, occasionally, that the lightest food irritates the stomach. Vomiting, hiccup, and nausea are not unfrequent attendants; particularly after taking food. Constipation, lowness of spirits, and considerable debility, are often produced. The symptoms are generally worse after eating, and are relieved, or disappear entirely, when the patient lies down. The tumour will be more sensible in the erect posture, or when the body is bent forwards; and cannot be distinguished in the recumbent position, in which indeed the parts pass back into the belly. Perhaps the fissure may be felt; and an impulse against the finger will then be distinguished on coughing.

Protrusions through the linea alba are much less frequent below than above the umbilicus.

The linea semilunaris, † the hypochondria, ‡ the sides

* Arnaud saw one at the side of the ensiform cartilage, not larger than a cherry-stone. *Traité des hernies*, tom. i. Preface, p. 83.

† LE DRAN, *Traité des Operations*, p. 143. KLINKOSCH, *Programma, quo divisionem herniarum, novamque herniæ ventralis speciem proponit*. Prag. 1764. Also in SANDIFORT'S *Thesaurus diss.* tom. ii; and in the *Dissertationes Pragenses*, vol. i. Sir A. COOPER has seen three instances of it; and the tumour was below the level of the umbilicus in all. *On Crural and Umbilical Hernia*, p. 58.

‡ LA CHAUSSE *de hernia ventrali*, § 12, Argentorati, 1746; also in HALLERI *diss. Chirurg.* tom. iii.; see § xii; GUNZ *de herniis*, p. 91; HEISTER *diss. de hernia incarcerata, suppurata, &c.* § 5; in HALLER'S *diss. chir.* tom. iii.; SOELMERRING *uber die Ursache, &c. der Brüche am Bauche und Becken*, p. 31: a ventral hernia in the right hypochondrium, about the level of the navel, from lifting heavy burdens. LODER'S *Journal*, vol. iii. p. 447. In a case of hernia, consequent on a severe injury, described by M. CLOQUET the tumour, about the size of a nut, was situated between the eighth and ninth ribs, at the junction of the cartilage and bone. It sometimes increased to the size of an

of the belly between the ilia and the last ribs, * and the lumbar region, † may be the seats of ventral ruptures; but such cases are rare.

The most circumstantial description that we possess of a lumbar hernia is given by M. JULES CLOQUET, in his valuable *Recherches sur les causes et l'anatomie des hernies abdominales*. This rupture, caused by a sudden effort in a man seventy-five years old, was characterised by a rounded slightly prominent tumour on the right side of the lumbar region, an inch and a half below the last rib, and five fingers' breadth from the spinous processes. It was enlarged and rendered tense, so as to communicate an impulse to the hand on coughing or other efforts; and it was attended with pain in the part, colic, nausea, and constipation. When the patient was placed on his belly, pressure removed the swelling; a hollow was left in its place, and he felt relieved. The return of the prolapsus was prevented by a pad, fastened in its place by an elastic belt, buckled over the part; this permanently removed all uneasiness. The tumour, however, would reappear when this apparatus was laid aside.‡

The opening, through which the parts are protruded, is usually considerable in ventral hernia, more particularly in

egg, with all the symptoms of strangulation. It was excessively painful, and could not be reduced; nor could pressure or bandage of any kind be borne. *De l'Influence des Efforts sur les organes renfermés dans la cavité thorachique*; p. 63.

* PETIT *Tr. des mal. Chir.* tom. iv. p. 225. The tumour was as large as a child's head; and usually went back in the recumbent posture. LA CHAUSSE, lib. cit. § 12.

† RAVATON *traité des plaies d'armes à feu*; obs. 60. Of the case related in the *Philosophical Transactions*, No. 410, art. ii. by Mr. J. BUDGEN, and supposed to be a hernia of the urinary bladder at the loins, the particulars there stated are not sufficient to determine the nature; and they certainly do not authorize us in concluding either that it was hernia, or that the tumour contained the urinary bladder.

A girl was born with an indolent tumour, of the colour of the skin and size of a pigeon's egg, near the lower vertebræ. At the age of ten years it had acquired the size of a calf's bladder, and in seven years more that of a cow's. At this time it broke and discharged much fluid, "instar urinæ." "Re perspecta, invenimus tunicas (et interius materiam mucosam) ureteres, venas et arterias, tales omnino, quales vesica habere consuevit; nec defuit commercium quoddam cum partibus internis per foramen in vertebris digitum hominis minorem in abdomen admittens, quod vasa memorata recipiebat." She died in four days, and if the parents had allowed examination after death the narrator has no doubt that the tumour would have been found to consist of the bladder; for the girl had not made any water since the swelling burst.

‡ P. 4 and 5; note.

such as do not happen in the linea alba. Hence the tumour is broad and flat ; the basis being the largest part ; hence also it generally disappears, or is easily reduced, in the recumbent posture ; and is seldom strangulated.

CAUSES.—Since there are no natural openings in the abdominal parietes, in those situations where ventral ruptures occur, it appears difficult at first to account for their formation. Small blood-vessels and nerves come through the muscles to the integuments, and it has been conceived that the openings, for transmitting these, when larger than usual, may favour the occurrence of herniæ : but this explanation is at best doubtful. Such apertures are not noticed in the linea alba, where ventral herniæ usually occur : and, although they are numerous in the aponeurosis of the obliquus externus, they are completely shut up towards the abdomen by the muscles situated behind that aponeurosis.

Sometimes there seems to be a natural weakness in the construction of the linea alba, favouring the occurrence of ruptures. Sir A. COOPER* saw three ruptures in this line in a child. GUNZ† and WRISBERG‡ found them in young subjects, in conjunction with exomphali. A more general deficiency of the same kind has been observed, producing a fissure of two fingers' breadth from the chest to the pubes, at which the bowels were easily protruded and replaced. §

These ruptures sometimes take place suddenly, from a considerable bodily exertion, and with a sense of laceration, or of something giving way. It is certain that the abdominal muscles are strongly contracted on such occasions, and we can conceive that some part may be actually torn, so as to give rise to the rupture. A case, which I examined after death, clearly proves that such lacerations do occur. A woman, who had been admitted into ST. BARTHOLOMEW'S Hospital in December, 1809, for a strain, caused by lifting a heavy table, died there from an attack of inflammation in the chest. She had complained merely of pain in the loins on her admission. Both the recti abdominis muscles were lacerated through about one-third of their thickness ; and there was a small quantity of coagu-

* *On Crural and Umbilical Hernia*, p. 58.

† *De Herniis*, p. 72. In a boy of eighteen weeks.

‡ RUDOLPHI, *Diss. de peritonæi diverticulis ; iisque imprimis, quæ per umbilicum et lineam albam contingunt*. Obs. 1. In a girl of five years.

§ *The New London Medical Journal*, 1792, vol. i. In a child of two years.

lated blood about the torn fibres. The sheath was not ruptured.*

Penetrating wounds of the abdomen are often followed by ruptures. A case of this kind is related in chap. ii, at p. 46; and, in an instance observed by Mr. WARDROP,† where a piece of wood had penetrated the cavity half way between the spinous process of the ilium and the pubes, an enterocele of six inches in length by four in breadth, with very thin coverings, and easily reducible, took place.

Some years ago I attended, with Mr. HOLT of Tottenham, a boy about twelve years old, with a considerable wound of the abdomen, not followed by hernia. It was inflicted by the tusk of a boar; and I found the greater part of the stomach, distended by a hearty dinner recently taken, the omentum, the transverse arch of the colon, and some convolutions of small intestine, protruded, and lying naked on the belly. When the parts had been returned, which was not accomplished easily, or quickly, they could only be kept in by a close and firm uninterrupted suture. Copious bleeding, purging, and starvation, were the means by which the patient recovered from this formidable injury. No protrusion followed in this case.

It has been asserted, that abscesses in the muscles are followed by ventral ruptures:‡ blows, too, seem to have produced them in some instances. They could hardly occur in the situation of the recti, or where the abdomen is covered by the three broad muscles at the side, without some previous injury to the parts, as from a wound.

The distention of the belly in pregnancy‡ is favourable to the occurrence of ventral herniæ; and particularly to

* There is a case in the Parisian Journal, in which the peritoneum and abdominal muscles were torn across for the space of three inches by a fall from a considerable height, vol. i. p. 366.

† COOPER, pt. ii. p. 60.

‡ “A l’égard des abcès, pour qu’après leur guérison ils laissent une disposition à la hernie, il faut que la matière qui les forme, se trouve logée entre le péritoine et les muscles. J’ai vu deux fois ce cas, et l’un et l’autre à la suite des grossesses.” PETIT, lib. cit. p. 259.

See also the reference in the note, p. 46.

§ SCARPA observes, that the superior portion of the linea alba yields more than the inferior to the impulse of the uterus and abdominal viscera; and that if we examine carefully, in those who have had many children, the superior portion of the aponeurosis, and place it opposite to the light, it is found to be irregular, thin in some places, and transparent, in others wasted, and disposed to separate longitudinally or transversely. M. 5. § 10.

that description, in which the parietes yield through a large extent.

ANATOMY.—The peritoneal sac of a ventral hernia is covered by an exterior investment produced by the condensation of the surrounding substance: and this is again covered by the integuments. Those, which follow wounds or abscesses, are said to have no sac; because, as it is alleged, the divided peritoneum does not unite again. I believe that this point has not been proved by any well-authenticated facts.

The sides of the aperture are tendinous when the rupture occurs in the linea alba; but they will differ in this respect according to the situation of the protrusion.

TREATMENT.—The symptoms and the treatment of ventral hernia in general, are the same as those of ruptures in other situations; and the usual precautions of avoiding costiveness, great exertion, and any species of clothing that presses tightly on the lower part of the chest, or on the abdomen, are as necessary in these as in other herniæ.

BANDAGES.—The observations, which have been made on the bandages for umbilical herniæ, will apply for the most part to the ventral species also. A small rupture of the latter kind, such, for example, as occur in the upper part of the linea alba, may be very conveniently kept up by an ordinary inguinal truss, slightly modified, if it should be necessary, according to the circumstances of the case. By such simple treatment patients have been relieved from distressing symptoms, and sometimes recovered from a condition of considerable apparent danger.* When the tumours are more considerable, the truss devised by Mr. EAGLAND, and described in the chapter on umbilical hernia, p. 553, is the best. Sometimes a broad laced corset of leather, or other stout material, with a suitable compress, has been found the most easy way of managing the tumour.†

* “ J’ai plusieurs fois vu des malades attaqués depuis longtems de nausées, d’envies de vomir, de coliques et de constipations, auxquels on administroit des medicamens de toute espece sans aucun succès, et qui ont été guéris, comme par enchantement, par l’application d’un bandage qui retenoit une hernie ventrale a peine sensible.”—SABATIER, *de la Médecine opératoire*; tom. i. p. 176.

† “ Il n’y a pas longtems que j’ai été consulté avec plusieurs de mes confrères, pour une hernie de cette espèce, qui étoit audessus du nombril. Lorsqu’on posoit le doigt sur l’écartement des muscles, et que le malade faisoit effort pour lever la tête de dessus l’oreiller, ce doigt se trouvoit serré

STRANGULATED VENTRAL HERNIA.

The most frequent kind of ventral hernia, that which occurs through an opening in the linea alba, is closely analogous to the exomphalos in the aperture of protrusion, the anatomical characters of the swelling, the liability to strangulation, and the mode of operating.

In a corpulent person, the tumour, especially if of moderate size, may not cause an external swelling, and might thus escape notice, unless the abdomen were examined carefully.

A case of this kind, which terminated fatally, the existence of the rupture not having been discovered during life in consequence of its being imbedded in fat, occurred to Mr. HAMMOND at Windsor. There was, in this patient, a reducible exomphalos; symptoms of strangulation came on, and soon destroyed life. There were three inches and a quarter of fat under the integuments of the abdomen. "A ventral hernia, containing a globular piece of nearly mortified small intestine, about an inch in diameter, was discovered in the linea alba, about midway between the umbilicus and the pubes; but so deep, and so distant from the surface, as to be quite undistinguishable by any external examination," *

Other ventral ruptures seldom become strangulated, in consequence of the large opening, by which the viscera pass out of the abdomen. Very few instances of such an occurrence are recorded. LITTRE † mentions a fatal strangulation of the colon in a small ventral hernia of the linea alba; PETIT ‡ saw a hernia between the last rib and the pelvis in a state of incarceration; and Sir A. COOPER § mentions an unsuccessful operation in a protrusion at the linea semilunaris.

et embrassé sur les côtés. Il y avoit vomissemens frequens et douloureux, qu'on ne pouvoit attribuer a aucune autre cause, puisque le jeune malade se portoit bien d'ailleurs. Nous conseillâmes un corset, qui se laçât par derriere, pour rapprocher les muscles, et qui portât anterieurement une pelotte platte et large pour soutenir la ligne blanche. Une autre fois j'ai vu une tumeur herniaire de forme alongée, dont le gros seur égaloit celle d'un pain de demi-livre. Le malade avoit sept à huit ans comme le premier. Mes conseils avoient été à peu près les mêmes."—SABATIER, lib. cit. p. 178.

* *London Medical Gazette*, vol. i. p. 371.

† *Mém. de l'Acad. des Sciences*, 1714.

‡ *Traité des Mal. Chir.* ed. ii. p. 225.

§ *On Crural and Umbilical Hernia*, p. 60.

We should, therefore, place more reliance on purgatives and clysters, and persevere longer in employing them in strangulated ventral ruptures of this kind than in the more common forms of the complaint. There is no difficulty in the operation, should that be required; nor are any particular directions or precautions necessary. There cannot be any important vessels near the mouth of the sac. If the rupture exceed a moderate size, it would be advisable to operate without opening the tumour.

DISTENTION OF THE ABDOMINAL PARIETES.

There is another form of complaint, which, as the viscera are not protruded from the cavity, does not come properly under the denomination of a rupture: but its causes, nature, and treatment, are so closely analogous to those of ruptures, as to justify the arrangement by which the two subjects are brought together. The muscular and tendinous parietes of the abdomen, being weakened, yield altogether, and are distended so as to form a large tumour. RICHTER* saw a broad swelling, equal in size to a woman's breast, in each groin of the same individual: the case seems to have been of the description just mentioned.

But the linea alba is the most frequent seat of the affection, and its dilatations may vary considerably in degree, including only a small part of this line, or its whole length. In a woman of weak constitution, after several difficult labours, SOEMMERRING† saw the linea alba give way above the navel. MOHRENHEIM‡ observed a general yielding of the whole tendinous line, from the ensiform cartilage to the pubes, after a bad labour. It formed an oval tumour, when the trunk was inclined forwards; a narrower and more elongated prominence, when the person was erect.

The tumour, in these cases, will necessarily have an elongated figure; and the margins of the opening are formed by the recti muscles. The distention of the abdominal

* *Traité des Hernies*, p. 8. There are two examples of the same kind of hernia in HENCKEL, *Chirurgische Operationen*, tom. iv. p. 67 and 76; an analogous instance is recorded by SIEBOLD in LODER's *Journal*, 1797, vol. i. p. 215. The tumour, equal to a loaf of bread in size, was situated between the cartilages of the ribs and the umbilicus.

† *Ueber die Ursache der Brüche am Bauche und Becken*, p. 27.

‡ *Beobachtungen verschiedener chirurgischer Vorfälle*, 1783, vol. ii; a corresponding case is related in the *Acta Physico-Med.* vol. ii. obs. xciv.

muscles in pregnancy particularly disposes to this affection, which seems almost confined to the female sex. If the interval between the recti is naturally broad, and the linea alba weak, this kind of rupture will more easily occur. There is no fear of strangulation, since the base of the tumour is the broadest part; and the opening in all cases is free.

These dilatations of the abdominal coverings have sometimes proceeded to an enormous extent, so as to deserve the name, applied to them by the French,* of *éventrations*. RUYSCH saw the gravid uterus contained in a large bag formed by the yielding of the abdominal coverings, and hanging down to the knees: and a similar case is mentioned by LORRY.†

An observation recorded by PETIT,‡ shows us to what extent these dilatations may proceed, and should inculcate the necessity of an attention to them in their commencement. An infant, in whom a weakness of the linea alba was observed, wore for a long time a corset that laced in front, and supported the whole abdomen. This was left off at the age of four or five years; and she grew up without experiencing any inconvenience. She was seen by PETIT in the sixth month of her first pregnancy; at which time there was an enormous tumour, containing the gravid uterus, besides intestines and omentum, and formed by the yielding of the linea alba. She had experienced occasional attacks of colic and vomiting; which had become more and more violent and frequent. GARENGEOT saw a case of this kind, in which the tumour hung half way down the thighs; and LA PEYRONIE communicated to the French Academy of Surgery two instances of the same description.§

The support of broad and firm bands, laced or buckled before or behind, with the addition of compresses, according to circumstances, is necessary in these cases.

* PETIT, lib. cit. p. 224 and 237, 2nd edit.; SABATIER, *de la Méd. Opérat.* tom. i. p. 178.

† *Journal de Médecine*, tom. lxi. p. 274.

‡ Lib. cit. p. 237.

§ *Mém. de l'Acad.* tom. i. p. 701.

FATTY TUMOURS ON THE LINEA ALBA, RESEMBLING RUPTURES.

We sometimes observe small collections of fat, from the size of a nut to that of an egg, connected by pedicles, which pass through slits in the linea alba to the peritoneum : they have been called by the French * *hernies graisseuses*. They may be mistaken for omental ruptures, especially if they admit of being more or less completely returned ; and the mistake would be more likely to occur if there were any intestinal disorder, that might, with probability, be referred to a rupture as its cause. † Hence we find that such tumours have been even operated on as herniæ. In a case, where this happened at the Hôtel Dieu, the tumour, situated above the navel, was a mass of yellow fat. ‡

SCARPA § has related, with great candour, an instance of the same description which occurred to himself. A woman was seized with colic, accompanied with painful tension of the abdomen, nausea, and suppression of stools. A tumour was found below the umbilicus, on the left side of the linea alba, of the size of a large nut. Its contents, as disclosed by the operation, were a small mass of hard fat, continued into a pedicle, which evidently passed through the linea alba, and was removed by a stroke of the knife.

The author last quoted saw two in the dead body of a man fifty years of age : one immediately below the ensiform cartilage, the other a little above the navel. The first was of the size of a small nut ; the other of a pigeon's egg. Both consisted of firm adipous substance, continued into a flattened pedicle, which passed through the linea alba. || PELLETAN ¶ has seen five or more in one individual ;

* PELLETAN, *Clinique Chirurg.* tom. iii. p. 33, et suiv.

Mr. BIGOT has published a thesis on the subject ; *Diss. sur les tumeurs graisseuses extérieures au péritoine, qui peuvent simuler les hernies*, Paris, 1821.

† MORGAGNI relates the case of a patient affected with intestinal disorder, who had a tumour of this kind above the navel. Examination after death proved that it consisted of mere fat. *Epist.* xliii. art. x.

‡ PELLETAN, *lib. cit.* p. 40. note 1.

Another instance is mentioned by Mr. TARTRA ; *Journal général de Med. Chir. et Pharm.* an. 1805 ; and Mr. OLLIVIER, the translator of the *Supplément au traité prat. des Hernies*, par A. SCARPA, has recorded a similar example at much length ; p. 109, note.

§ *Mem.* v. § xiii.

|| *Loc. cit.*

¶ *Lib. cit.* p. 38.

chiefly in the course of the *linea alba*. Mr. FARDEAU* met with three in the body of a man which he dissected; one just below the ensiform cartilage, a second two inches above the navel, and a third at the outer side of the spermatic cord. The first was about the size of a nut; the second of an egg; and the third of a testicle.

I have frequently seen these small tumours in dissection, and have always found them to consist of mere fat.

In the observations on the diagnosis of inguinal ruptures, the occurrence of similar masses of fat in the spermatic cord has been mentioned. See *ante*, p. 50. Other cases are described shortly at p. 20.

* *Observation sur trois hernies graisseuses sur le meme individu*, in the *Journal Gen. de Méd. &c. ou recueil publié par la Soc. de Méd.* par SEDILLOT, tom. xviii. p. 268.

CHAPTER XX.

HERNIA OF THE BLADDER, OR CYSTOCELE.

THIS kind of rupture takes place most frequently through the abdominal ring: it has been observed also at the crural ring, in the perineum, and the vagina. When we consider that the fundus of the urinary bladder, in the natural state, rises above the pubes only when the cavity is distended, and that its anterior surface is connected by cellular membrane to the surrounding parts, it seems difficult to account for the protrusion of the organ; the occurrence is accordingly rare: but the examples are so well authenticated as to remove all doubt respecting the fact. Experience has shown, not merely that the bladder may be protruded at the abdominal ring, but that it may descend even to the bottom of the scrotum. Cases, too, are recorded, in which this organ is said to have been contained in an inguinal and vaginal rupture of the same subject, * and in a bubonocoele on both sides of the body.†

It is necessary to the occurrence of a cystocele, that the bladder should be placed immediately behind, or very close to the ring; and that it should hold that situation when empty: for the distended condition of the organ is obviously so very unfavourable to a protrusion, that it can hardly be deemed possible in that state. Repeated distensions of the bag, from any cause, must therefore be regarded as particularly disposing to this kind of rupture: and the lateral extension of the viscus in pregnancy facilitates its occurrence. We often discover the bladder, on dissection, adhering in such cases to the back surface of the ab-

* See the excellent memoir of Mr. VERDIER, entitled, *Recherches sur la hernie de la vessie*, in the *Mém. de l'Acad. de Chirurg.* tom. ii. p. 22.

† LEVRET, *obs. sur les polypes*; p. 145: quoted in RICHTER, *Tr. des. Hern.* chap. xlii.

dominal muscles, instead of having its fundus behind the pubes. These causes, however, exist in abundant instances without giving rise to herniæ of the bladder; and the latter complaints cannot, in many cases, be traced to any causes of the nature now alluded to.

If the bladder, either from being naturally large, or from having its capacity increased in consequence of retention of urine, is placed behind the ring when undistended, it may be propelled through the opening just as easily as any other of the abdominal contents. In this case, a portion of the anterior surface is first protruded; and, as this is connected by cellular substance to the surrounding parts, without possessing a peritoneal covering, the rupture in this stage possesses no hernial sac. When we observe the fundus of the bladder, in retentions of urine, rising to the umbilicus, or higher, notwithstanding the cellular adhesions which unite it to the pubes, we shall conclude that these connexions will not prevent the rupture from increasing under the continued action of the same causes which first produced it. The neighbouring part of the fundus, or side of the bladder, where it is covered by peritoneum, is gradually drawn through the ring, and forms a kind of hernial sac, which has a different relation to the protruded part of the bladder, from that which the peritoneal covering bears to the contents of an ordinary rupture. It forms a membranous cavity, ending below in a cul-de-sac, opening above into the abdomen, and lying in front of the bladder, to the anterior surface of which its posterior half closely adheres. The omentum or intestines may easily descend into this pouch; and thus an omental or intestinal rupture will be superadded to the hernia of the bladder. It has not been ascertained whether these protrusions occur in the course of the abdominal canal, or come directly through the opening in the aponeurosis of the obliquus externus. If the situation of the upper opening be compared with that of the bladder, it would seem difficult for a cystocele to take place at that aperture; while its occurrence at the lower opening can be readily conceived. It was noticed in one case that the spermatic vessels were on the exterior side of the hernia.* When the protruded part descends into the scrotum, it will probably lie in front of the spermatic

* KEATE'S *Cases of Hydrocele, &c.*, to which is subjoined a singular Case of *Hernia vesicæ urinariæ*, &c. 8vo. London, — 1778.

cord; even although the latter part should have been placed exteriorly to the swelling at the ring.

As a cystocele may give rise, in the manner already described, to a protrusion of intestine or omentum, so an enterocele or epiplocele may cause a descent of the bladder. The symptoms of the latter occurrence have not been observed in many instances until long after the patients had been incommoded by an intestinal or omental hernia; and it has even been suggested that the former is always preceded by the latter complaint. But this is contrary to experience, which has shown us that a protrusion of the bladder may exist alone.

The manner in which an ordinary omental or intestinal rupture may become complicated by the addition of a cystocele, can be easily understood, when we consider that the peritoneum forming the sac was placed immediately behind the ring, and is continued over the fundus of the bladder. If the original hernia be neglected, its increase elongates the hernial sac, gradually drawing into the ring that portion of the peritoneum, which is attached to the bladder, and the bladder itself, if it be disposed to yield to this force. Thus a portion of the organ becomes situated behind the cavity of the first rupture; and it passes through the ring just as the fixed portions of the large intestine do in the gradual increase of a common scrotal rupture. See chap. ix. sect. vi.

The anatomical description is the same in this as in the preceding case. The protruded portion of the bladder is here interposed between the original hernia and the spermatic cord. The posterior surface of the sac, at its upper part at least, consists of the peritoneum covering the fundus and back of the bladder: and the proportion of the bag formed in this way depends on the extent of the protrusion.

A bubonocoele taking place through the abdominal canal gradually brings the upper opening behind the lower one, so that we can conceive the possibility of the bladder being drawn through the ring in the subsequent increase of the swelling. But the relative positions of the opening, and the bladder, render the occurrence of cystocele more probable as a consequence of the internal inguinal rupture. Sir A. COOPER met with a large protrusion of the bladder in an external inguinal hernia, which had descended into the scrotum, and has given two views of the parts. *

* Part i, ed. 2. Pl. xiii. fig. 5 and 6.

It will be obvious from the preceding account, that the urinary bladder must be differently circumstanced, in respect to its covering of peritoneum, from the more ordinary contents of hernial swellings. When the anterior part of the viscus is protruded, without the fundus being drawn into the ring, it will be everywhere adherent by cellular substance, and possess no sac at all. This was the case in an instance recorded by Mr. POTT,* where, however, the bladder had descended to the bottom of the scrotum. When the fundus or side has been protruded, the posterior part only of the swelling adheres to the surrounding parts, and there is a bag formed by the peritoneum in front. The cellular adhesions in both cases are such as render the return of the protrusion impossible.

Although the natural connexions might be expected to oppose any considerable displacement of this bag, we find that a large portion of it may quit the abdomen, descending to the bottom of the scrotum, and forming, when full of urine, a considerable tumour.†

In a case, of which the history and dissection are described by Mr. CLEMENT,‡ the entire bladder had passed through the inguinal canal into the scrotum, where it had become enlarged by distension, so as to form a tumour of enormous magnitude. The patient, a very corpulent man above sixty years of age, had been troubled with the swelling for twenty-five years. It was small at first, and slowly increased to its immense size, having varied but little during the greater part of the time above-mentioned. The patient could not make water without first raising the rupture towards the belly, and then rolling it about for a short time, when the urine would pass in a full stream, though he was unable to make much at one time. He had repeatedly suffered from constipation and slight attacks of hemiplegia; but the health had been good in other respects, and he had been accustomed to take regular and occasionally laborious exercise. The swelling had produced no alarming or dan-

* See the "*observations on ruptures*," in the third volume of his works; case xxiii.

† In the case already quoted from Mr. KEATE, the greatest part of the bladder was in the scrotum; and many instances, where the tumour was considerable, are recorded. See MERY, *Observations sur différentes Maladies*, in the *Acad. Roy. des Sciences*, an 1713; RUYSCH, *Observat. anatomico-chirurg. Centuria*; Obs. xcvi; VERDIER, in the *Acad. de Chir.* tom. ii. pp. 15, 20; POTT's *Works*, vol. iii. p. 323.

‡ *Observations in Surgery and Pathology*, p. 145.

gerous symptoms until a fortnight before death, when obstinate constipation came on, with paralysis of the left side. To these affections was joined stillicidium urinæ, for which the catheter was used several times; but not more than a teacupful of urine was drawn off on each occasion. Although purgatives and enemas produced no relief of the bowels, the symptoms were rather referable to retention of urine than constipation. There was pain about the pubes, and in the rupture, which became more distended: the power of articulation was lost; delirium, and death supervened. The true nature of the hernial tumour does not seem to have been suspected during life. The circumference of the swelling was twenty-nine inches; its length, fourteen inches and three quarters. The whole penis was retracted within the integuments, and the urine had been discharged through an opening resembling the navel. One of the testicles could be distinctly felt at the middle of the tumour; but the other was not discoverable before the parts were dissected. Although the rupture was so large as to extend generally over the pubes, and occupy both inguinal regions, the protruded parts obviously came through the left abdominal ring. When the inguinal canal had been exposed and opened, a portion of colon was seen traversing it, distended with feces, but not inflamed nor compressed, as the entire hand could be passed through the opening. On continuing the dissection, and after removing the testicle, the tumour was found to consist of a sac resembling an enormous hydrocele, from which two quarts of fetid urine escaped by the rupture of a part which had become red and pointed before death. It was now found out that the urinary bladder had passed through the abdominal ring, so as to form the immense scrotal tumour already described.

The part undergoes further changes after it has passed through the ring. It becomes contracted in the opening, and expands again below. Mr. KEATE "found it contracted at the ring, dilating itself again in the abdomen and pelvis, and forming a kind of double bag, divided by the ring."* And the same change had occurred to a still greater extent

* P. xli. BERTRANDI mentions an analogous case, in which there seems to have been also some formation of stone. "Vidi porro ego herniam vesicæ urinariæ, cujus transitus per anulum musculorum abdominis ita fuerat coarctatus et obstructus, ut non nisi perfracto tartareo quodam cæmento tenuem stilum trajicere possemus." *Mem. de l'Acad. de Chir.* tom. iii. p. 103.

in an instance operated on by Mr. POTT. He discovered a membranous bag, growing narrower as it proceeded upwards; and a membranous duct, about the size of a large wheatstraw, was continued from its upper end through the ring. The urine flowing through this, when it was divided, proved the case to be a hernia of the bladder.* Stones have been contained in the protruded portion in many instances.†

The symptoms of cystocele will be different according as the protruded portion is full or empty; confined to the groin or continued into the scrotum; and simple, or combined with intestinal or omental rupture. When the part is empty, its volume is not considerable, the sides collapse, and examination discovers nothing but a soft membranous substance rolling under the fingers. But the most characteristic circumstances arise from the state of the urinary evacuation. When there is a frequent desire to expel the urine, with occasional retention; when the tumour increases after retaining the water for some time, and is diminished, or entirely disappears on voiding the urine, the case must be a cystocele. The patient sometimes feels unable to expel the urine, without elevating and compressing the tumour; but he can accomplish it easily by that means. After voiding all that he can, a further desire to make water is excited by pressing the swelling. When the bladder has descended into the scrotum, and is full of urine, it might be mistaken for hydrocele. The dysury, the power of diminishing the swelling by pressure, and the desire of making water consequent on this, sufficiently distinguish the case. To the peculiar symptoms of cystocele will be added those of an intestinal or omental rupture, when the affection is complicated. In some cases the protrusion of the bladder has been attended with no symptoms. Its existence was not known until after death in Mr. KEATE's case, where the greatest part of the viscus had passed into the scrotum: and the same observation may be made concerning a case related by ARNAUD.‡

Surgical treatment can avail little in herniæ of the bladder. The part cannot be replaced, and we must therefore

* *Works*, vol. iii. p. 327.

† BARTHOLINI, *Hist. Anat.* cent. iv. hist. 28. *Acad. de Chir.* tom. ii. pp. 10, 13, 15. In the first of these cases there were four stones. POTT, vol. iii. p. 327.

‡ *Mém. de Chir.* p. 78.

be contented to support and press on the tumour by means of a suspensory bandage. If its existence were discovered in an early stage, perhaps it might be reduced by the constant pressure of a truss with a hollow pad. It seems to be hardly susceptible of strangulation. If a stone were discovered in it, we ought to remove it by an incision. No ill consequence followed in two instances, where openings were made in the protruded portion of the bladder.*

Hernia of the bladder, under the crural arch, is very rare: one case is mentioned in the memoir of VERDIER. †

The protrusion of the organ in a perineal or vaginal rupture will be indicated by the peculiar symptoms connected with the urinary evacuation. Its treatment does not differ from that of other ruptures in the same situations.

* *Acad. de Chir.* tom. ii. pp. 11, 13.

† P. 23.

CHAPTER XXI.

PERINEAL RUPTURE.

HERNIÆ may take place at the lower aperture of the pelvis. The parts descend at the side of the rectum, passing between the fasciculi of the levator ani,* or distending the fibres of that muscle, and form a tumour between the anus, the tuberosity of the ischium, and the end of the os coccygis.

In the female, protrusions may occur in the vagina ; or, passing along the side of that canal, may present in the labium : these, which are called vaginal and pudendal herniæ, will be considered in the next chapter.

The greater capacity of the female pelvis in all dimensions will explain the greater frequency of ruptures at its lower aperture in that sex. The perineal rupture, however, seems to occur as frequently in men, as in women. In eighteen cases brought together by Dr. JACOBSON, in the essay quoted below, the numbers of the two sexes were equal. In the females there were six intestinal and three vesical herniæ ; in the males, seven of the former and two of the latter.

As the rectum touches the vagina in the female, and the

* The situation in which the protrusion occurs may be seen in CAMPER, *Demonstrat. anat. pathol.* lib. ii. tab. ii. fig. i.

The supplement to the work of SCARPA contains the best illustration of the subject, in a memoir on hernia of the perineum, and five plates, which exhibit both the external appearance and the anatomy of the tumour in a case which the author attended and dissected. *Supplément au traité prat.* p. 118 ; pl. xv. —xix.

The ninth volume of GRAEFE and WALTHER'S Journal contains an essay on perineal hernia, by Dr. JACOBSON of Königsberg ; in which there is a detail of the cases hitherto recorded, and of two instances observed by the writer, with figures representing the external appearance of the swelling, and a truss employed for its treatment in one of the latter.

bladder in men, by its superior surface, the bowels will escape rather by the side of these viscera, than in the middle of the perineum.

There is a considerable distance between the surface of the body and the reflection of the peritoneum from the rectum to the side of the pelvis, of the vagina, or the bladder ; hence we can conceive that an imperfect protrusion may take place without forming an exterior swelling. Such an occurrence can be discovered by dissection only ; and we cannot recognise the perineal hernia until a tumour appears externally.

The contents of these ruptures have been some portion of the intestinal canal, or of the urinary bladder. In dissecting the body of a female, a stone three ounces in weight was found in a portion of the bladder, supposed to have been a perineal cystocele. The details are too scanty to enable us to estimate the nature of the case satisfactorily.*

The swelling possesses the ordinary characters of a rupture. It becomes larger and more tense in the erect position, or when the patient holds his breath ; smaller and softer when he lies down ; and it disappears entirely on pressure. It occasions various intestinal affections. From its immediate vicinity to the neck of the bladder, it will be likely to press upon and irritate that viscus ; and the swelling, which it forms, must be perceptible from the rectum. When the bladder is protruded, the peculiar symptoms mentioned in the last chapter will point out the nature of the case.

A more or less considerable protrusion of the vagina accompanies perineal rupture in the female. Hence Dr. JACOBSON calls it *vagino-perineal hernia*.

The treatment consists in replacing the parts, which may perhaps be facilitated by introducing the finger into the rectum or vagina, and preventing them from descending again by means of external pressure. This may be applied by means of the T bandage ; of which the portion passing between the thighs is furnished with a suitable compress, either of ivory, or of softer materials, adapted in shape to the part. If this should be insufficient, we may employ the instrument described in the case quoted below from SCARPA. The introduction of a pessary into the vagina, by keep-

* *Ephemerid. nat. cur.* Dec. ii. an. 5. obs. 71.

ing that cavity distended, may assist in preventing protrusion in the female subject.

SMELLIE has an instance, which will be mentioned below, of incarcerated perineal hernia. It would be the duty of the surgeon, if he met with such a case, to attempt relief by an operation.

The first observation of a perineal enterocele is ascribed by SABATIER to Mr. CHARDENON, a surgeon of Dijon. In examining the body of a man, who had died of an acute disease, he noticed the ileum descending into the middle of the pelvis between the rectum and bladder. The intestine gave way suddenly as he was endeavouring to draw it up, and a hernial sac, of the size of a pigeon's egg, came into view. It had a contracted entrance, with a hard and callous edge. By introducing a finger into the cavity, it could be distinctly ascertained that the sac was covered only by integuments; and when this was distended with lint, a tumour was observed in the perineum.*

The existence of this rupture was also ascertained after death in a male subject brought for dissection to the anatomical school at St. THOMAS'S Hospital. The peritoneum formed a bag of an elongated shape between the rectum and the under surface of the bladder and prostate. But its lower extremity did not reach the skin, so as to form any tumour. The mouth of the sac was two inches and a half from the anus. The case is represented in the work of Sir A. COOPER, who gives the following account of the relation which the hernial sac bore to the surrounding parts. The lower extremity of the hernial sac was placed before the anus. The prostate gland was situated immediately anterior to the fundus of the sac. The fundus of the vesicula seminalis was placed upon the lateral part of the sac, its apex was situated before it. The bladder covered about one inch and three quarters of the anterior part of the hernia. The mouth of the sac was two inches and a half from the anus." The sac was probably empty, as no mention is made of its contents.

The case of CARLO CAPELLA, related by SCARPA,† is the

* This account of the case is given in RICHTER, chap. xli. from LE BLANC'S *Précis d'Opérations*, Paris, 1775, t. ii. p. 244. The case is also quoted at full length in SCARPA, *Supplément*, p. 134.

† Pt. ii. p. 67; and pl. xi. fig. iii. BROMFIELD, in his *Chirurgical Observations*, vol. ii. p. 264, relates the case of a boy, in whom the small intestines protruded through the wound during the operation of lithotomy. This has been deemed an instance of perineal hernia; but the true nature of the case appears to me doubtful. Considering the age of the subject, (between six and

most accurate and satisfactory account, that we hitherto possess, of the perineal hernia. In consequence of an exertion made with the legs apart and the body bent forwards, a tumour suddenly formed at the right side of the anus, as large as a small nut, and receding on pressure. During a severe cold, which came on soon after, this tumour acquired the size of a pigeon's egg; and further efforts at a subsequent time made it very painful, with a benumbed sensation in the whole extremity. SCARPA, who saw him some years after the commencement of the affection, found a pyriform tumour near the margin of the anus, as large as a hen's egg, with the basis resting on the edge of the gluteus maximus, and easily reducible. He kept it reduced by means of a truss, consisting of a circular steel spring surrounding the pelvis and fastened in front, and of a segment of a circle continued from the back part of the former at right angles, curved a little forwards at its end, which was furnished with an oval pad, calculated to press on the tumour. The intestine, in one instance, became strangulated; but relief was soon obtained by fomentations and clysters. He died of a pulmonary affection. The ileum passed into a hernial sac, of which the orifice, nearly an inch in diameter and round, was situated at the right side of the rectum and bladder, and it was protruded in the interval between the right side of the anus, the tuberosity of the ischium, and the point of the coccyx. After removing the skin, a thin stratum of the fibres of the levator ani, separated from each other, was found to cover the hernial tumour; and, on turning this aside, the hernial sac was exposed. Its mouth was not within the pelvis, but lower, exactly in the perineum; thus it appears that this part is originally higher, and within the pelvis, but that it gradually descends. In its several dimensions, which were carefully measured, this pelvis equalled that of the female.*

SMELLIE has two examples of perineal rupture in his *Collection of Cases and Observations in Midwifery*. In the first of these there was a swelling at the left side of the anus, which had formed gradually; disappearing in the re-

seven, a period of life, at which no instance of such a rupture is recorded,) that no symptoms referable to hernia seem to have existed, and that the occurrence admits of easy explanation in another manner, I cannot believe that there could have been in this boy a hernial sac between the bladder and rectum capable of holding a considerable portion of small intestine.

* *Supplément*, p. 121.

cumbent, and coming down again in the erect posture. Labour-pains came on while the hernia was down, and considerable inflammation with strangulation ensued; the delivery was followed by a large discharge of blood; discutient fomentations and cataplasms were ordered to the part, and the swelling was reduced soon after. It appeared again in the following labour, when SMELLIE introduced his hand into the vagina and pushed it up, the child's head immediately descending into the pelvis.* In the second case, a swelling appeared at the left side of the perineum and anus, about a month after delivery. It increased considerably, protruding at first only when the patient was in the erect posture; and she could reduce it by introducing two fingers into the vagina. She became pregnant, and was seized with a violent cough, which enlarged the swelling to the size of a fist, and rendered reduction very difficult. Great pain was experienced in the part as she increased in bulk, and about five weeks before labour the swelling became quite irreducible. After this had continued for some days, SMELLIE found her in great agony, with the surface of the tumour livid. It burst, and gave issue to a spoonful of pus mixed with blood, and afterwards to half a pint of greyish blue fluid. She was immediately relieved, and exclaimed that the intestine had gone up. Although the fluid, supposed by her attendants to come from the intestines, still continued to escape, she recovered quickly, went her full time, and was delivered without any unpleasant occurrence. A little fluid still oozed from a small orifice some months after delivery; she continued subject to occasional violent pain and constipation; the rupture appeared again, in consequence of an effort, but it was reducible.

Dr. JACOBSON saw at the clinical institution of Königsberg, a young man, twenty years of age, with a swelling consequent on a fall. It was the size of a hen's egg, and placed immediately in front of the anus. The swelling disappeared in the recumbent posture; and the patient could easily return it. He employed a compress with a T bandage, and thus prevented the descent of the rupture. The swelling disappeared gradually and entirely.†

In a female seen by SCHREGER, there was a swelling in the left side of the perineum, consequent on an exertion in

* Case iv. p. 144.

† GRAEFE and WATHER's *Journal*; v. 9, p. 399.

lifting. The posterior surface of the vagina was at the same time elevated into a swelling which obviously contained a portion of intestine.*

Perhaps the two cases, quoted in the first note to chap. xxiv, ought to be regarded as examples of perineal herniæ.

MERY saw a tumour larger than a hen's egg, between the os externum and the anus, in a woman about five or six months gone with child. She experienced difficulty and pain in making water; but when he pressed the tumour it disappeared, and urine was voided.†

Another example is recorded by VERDIER.‡ A lady, in the sixth month of pregnancy, consulted a surgeon for a difficulty in making water. There was a tumour on one side of the perineum. A fluctuation could be perceived in this; it disappeared on pressure, and came down again when the compression was discontinued. When considerable force was used, a small quantity of urine escaped through the urethra. The swelling went away after parturition, and came on again at the end of the second pregnancy. It was now considerably larger, and occupied the whole perineum. It was treated with compresses and bandage.

PIPELET§ relates a case, which he conceives to have been a protrusion of the urinary bladder at the perineum of the male subject. A considerable exertion in leaping was followed by severe pain in the perineum; and the patient constantly felt after this time an uneasiness, with a sense of weight in the part. But he complained chiefly of being able to make only a small quantity at a time; and of being obliged to press on the swelling in order to facilitate the process. This pressure, however, procured a more abundant discharge of urine. The swelling was oblong and soft, and equal in size to a hen's egg. It could be easily reduced. Compresses and a bandage kept it up.

Dr. JACOBSON had under his care in the clinical institute of Königsberg a patient who had received a severe blow on the perineum from falling with the legs astride on a ladder. The immediate consequence of the injury was retention of urine from rupture of the urethra. Some

* *Ibid*, p. 397.

† *Mém. de l'Acad. des Sciences*, année 1713; p. 111, obs. ii.

‡ See his *Memoir* already quoted, p. 25.

§ *Mém. de l'Acad. de Chirurgie*, tom. iv. p. 182.

weeks afterwards a soft circumscribed swelling of oval figure, equal in size to a large walnut, was found between the scrotum and anus, rather towards the left side. It disappeared under pressure; and by following the tumour with the finger, a round opening could be felt in the middle of the perineum, into which the end of the finger would pass. The tumour did not reappear so long as pressure was kept up on this part, but it descended immediately on its removal. The patient was obliged to press the swelling when he made water; and he voided his urine, from the time of the injury, in a small stream or by drops, and with pain. A truss with a pad to press on the tumour, like that employed by SCARPA in the case already quoted, was used with advantage; but the patient, being obliged to work hard, neglected the complaint, left off the bandage, and discontinued all treatment.*

Dr. JACOBSON has also described a perineal enterocele, which he treated in a female forty-two years of age. During the latter months of her fourth pregnancy she had been much troubled by a cough. The delivery took place suddenly and unexpectedly, the poor woman having been at work and hardly able to sit down before the child and the after-birth came away. At the same time a prolapsus of the rectum occurred, to the size of a fist, and acute pain was felt in the perineum. The rectum receded, the cough continued, and the patient got up the third day to attend to her domestic affairs. She now perceived for the first time a small, soft, indolent and movable swelling near the anus on the right side, which disappeared in the sitting and lying postures. It gradually increased in size, and a similar soft swelling took place in the vagina, protruding its posterior surface, and projecting a little between the labia under the impulse of coughing. In two years and a half the tumour had attained a considerable magnitude, causing not only inconvenience in progression, irregularity and difficulty in voiding the feces, and dragging pains in the body, but constant uneasiness and weakness of the right leg, with serious lameness. The swelling, which measured when most tense six inches and a quarter in circumference, is placed between the anus, the tuber ischii and the os coccygis, in front of the lower edge of the gluteus maximus. It

* *Lib. cit.* p. 418. The case was selected by Dr. KOST as the subject of an inaugural dissertation, under the title *de cistocoele perineali, c. tabula lithographica*; Königsberg, 1826.

varies in size like other ruptures, and its contents pass back into the pelvis, with an audible gurgling, when it is compressed. In the latter case, a loose empty bag of skin remains, and, on pushing this up with the finger, a circular opening, with unyielding sides, an inch in diameter, is plainly felt between the anus and the tuberosity of the ischium. The rupture always goes up spontaneously in the attitudes of sitting and lying, and descends immediately when the patient rises. The projection into the vagina nearly corresponds in size to the perineal swelling. When the latter is replaced, the vaginal tumour disappears also; but if we push up the vaginal rupture, that in the perineum is not affected. There is also an incomplete inguinal hernia on each side. This patient was supplied with a truss similar to that of SCARPA, two pads being added to it in front for the purpose of keeping up the bubonocoeles. This instrument perfectly fulfilled its intention, and freed the patient from the various inconveniences which the complaint had caused.*

* *Ibid*, p. 425. The external appearance of the swelling and the construction of the truss are exhibited in tab. vi, fig. 1, 2, 3, 4.

CHAPTER XXII.

VAGINAL RUPTURE.

THE tumour, in this case, is contained in the cavity of the vagina, and its external surface is formed by the membrane of that canal. The peritoneum is continued from the back of the bladder to the front of the uterus, without covering any portion of the vagina. When the membranous cul de sac formed between the two organs is pushed downwards, a swelling takes place at the upper and back part of the vagina. From the rectum the peritoneum is continued to the posterior surface of the vagina; of which the posterior half is covered by that membrane. A protrusion in this situation must form a swelling at the lower and middle part of the canal. The immediate contact of the vagina with the rectum and bladder prevents this kind of tumour from presenting exactly at the middle of the upper or lower surface of the canal, and occasions it to assume generally a lateral position.

The situation, in which the protrusion begins, is the same as in the perineal rupture; but the difference between the two cases is, that the vagina, which resists in the latter, yields in the former instance. Hence we should expect, what we find by experience to be true; viz. that women who have had children are the most subject to this complaint. The distension of the vagina and surrounding parts in such persons must weaken the powers of resistance. It may occur, however, in females who have never borne children.*

The small intestine seems to be the part most frequently protruded: the urinary bladder sometimes descends, and

* RICHTER, p. 286 ; COOPER, pt. ii. pp. 65 and 66.

the tumour then is on the anterior or upper surface of the vagina.

The causes of the complaint do not differ from those of other ruptures: it has generally been formed in consequence of bodily exertion, as in raising a great weight, straining at stool, &c. HOIN* mentions the case of a young girl, subject to constipation, who was obliged to use violent exertion in expelling the feces; a vaginal rupture occurred from an effort of this kind.

The swelling is soft and equable, increasing by standing, and diminishing, or entirely disappearing in the recumbent posture. It becomes more tense when the patient holds her breath, and an impulse is felt in it on coughing. The contents may be readily pushed up by the hand; but they descend again if the patient coughs or strains. An increase of the swelling, with a painful sense of bearing down, and of something giving way, precludes all laborious exertions, when no means have been employed to remedy the complaint. Disorders of the alimentary canal are often present. Frequently the bladder is affected, from the immediate vicinity of the tumour; and the symptoms connected with the urinary evacuation will be more marked where this bag itself is protruded. In such a case, pressure on the swelling occasions a discharge of urine through the meatus urinarius. The nature of the affection is sufficiently pointed out by the characters already enumerated; but the possibility of a mistake is still further precluded by the power of feeling the os uteri in its natural state and situation behind the swelling.

The treatment of the case will consist in returning the parts by the pressure of the hand; and here the surgeon must remember, that the passage, by which the contents of the swelling descend, is of considerable length, consequently, that a portion of intestine may be contained in it, although the obvious tumour be reduced. Hence we should press on the surface of the vagina as far as the os uteri, so as to remove whatever might be contained in the neck of the sac. When complete reduction has thus been accomplished, future protrusion must be prevented by the use of

* In his "*Essai sur les Hernies rares, et peu connues*," published in LEBLANC'S *Nouvelle Methode d'operer les Hernies*; 8vo. Paris, 1768. This work, which I have not seen, is quoted by RICHTER. The author mentions another instance, in which the complaint occurred on the seventh day after parturition, from lifting a pitcher of water.

a pessary. Since this object cannot be obtained without distending the sides of the vagina, pessaries of the common form are not sufficient. The globe-shaped instrument has been found to answer; but the hollow cylinder is the most suitable.

If any difficulty should be experienced in the reduction, the recumbent position and the use of clysters would probably be sufficient to overcome it. But the most serious inconvenience would arise from the rupture protruding during parturition; and this consideration should lead us to adopt every measure which can obviate such an occurrence. Pressure should be made on the opening during the pains, until the head has descended into the pelvis; or, if the tumour is down, it should be pushed back into the abdomen, by introducing the hand into the vagina;* but if the head has descended, perhaps it would be best to accelerate the delivery as much as possible.

SANDIFORT† had an opportunity of examining a vaginal enterocele after death. A large oval tumour, in an old woman, proceeded from the back of the vagina, and protruded at the orifice of that canal. Its contents could be pushed back into the abdomen, but speedily returned. He found in it a large portion of the small intestine, which entered by a round hole between the vagina and rectum. The cavity was lined throughout by peritoneum.

The following case, related by GARENGEOT,‡ is considered to have been the first distinct notice of the vaginal rupture. A woman, who had borne five children, felt acute pain in the vagina, in consequence of lifting a burthen. At the same time a swelling took place in the part. This gradually increased, until it passed the os externum. The patient felt occasional colicky pains, dragging at the stomach, and difficulty in voiding the urine. GARENGEOT felt the os uteri in its natural situation behind the tumour, and found the latter diminished by one-half, in consequence of his examination. On making the patient lie down, he easily pushed back all the contents of the swelling, when the upper and right portion of the vagina felt lax and thin. He now made her rise, walk about, and cough, which

* SMELLIE'S *Cases*, p. 148.

† *Observat. Anatomico-Patholog* lib. i. cap. iv. "De hernia intestino-vaginali, aliisque hujus morbi speciebus."

‡ *Mém. sur plusieurs Hernies singulières*, in the *Acad. de Chir.* tom. i. p. 707, et suiv.

brought down the tumour again. After replacing it, he introduced an oval pessary, which succeeded for the first day; but, on the second, pain and vomiting came on, in consequence of the intestine being compressed between the instrument and the pubes. A hollow cylindrical pessary was then substituted, and kept up the parts completely. ARNAUD had employed the same means in a similar case.

A surgeon, having been called to a woman in labour, found the entrance of the vagina occupied by a large tumour, proceeding from its upper and anterior portion. The introduction of the catheter did no good, until pressure was employed at the same time; the urine then flowed off, the swelling was removed, and delivery was speedily and successfully completed.*

A large protrusion of the bladder into the vagina is recorded by SANDIFORT.† Retention of urine, and difficulty of introducing the catheter, followed a violent cough. A large tumour occupied the whole cavity of the vagina. Fluctuation could be felt in this, but no urine was evacuated on pressure unless the catheter was introduced at the same time; then a plentiful evacuation ensued, but the contents were not entirely discharged, unless the compression was continued. When all the urine had been drawn off, the catheter could be easily introduced, the tumour had disappeared; the superior part of the vagina felt lax and flaccid; and the finger could be pushed up to the mouth of the uterus, till the swelling began again to increase by the urine collecting in the bladder. The use of the pessary produced a perfect cure. Three other cases of large swellings in the vagina, reduced by the employment of the catheter, and again increasing, were communicated to SANDIFORT by a very skilful physician, who practised midwifery.

M. CHAUSSIER found a vaginal cystocele, as large as the crown of a hat, in a patient who had made a great effort seven days after her delivery. A considerable tumour followed the exertion immediately, and increased, with complete retention of urine, for three days, when M. C. saw her. He succeeded in replacing it by gentle pressure:

* VERDIER *Mém. sur la Hernie de la Vessie*; in *Mém. de l'Acad. de Chir.* tom. ii. obs. xviii. p. 33. See also the observations of Mr. CHRISTIAN on the retardation of delivery by fulness and prominence of the bladder towards the vagina, in the *Edinb. Med. and Surg. Journal*, vol. ix. p. 285. I doubt, however, whether hernia of the bladder existed in the cases to which he alludes.

† *Obs. Anat. Pathol.* lib. i. cap. iii. De hernia vesicæ vaginali.

more than three pints of urine were slowly discharged, and the patient recovered without any permanent ill consequence.*

RICHTER† saw two instances in which the tumour was not larger than a nut.

Sir ASTLEY COOPER saw a patient in GUY's Hospital with a protrusion at the upper surface of the vagina, which seems to have been an enterocele. She was twenty years of age, and had not borne children. There was "a swelling a little above the os externum vaginæ, the size of which was that of a small billiard-ball. It was situated to the posterior part of the vagina, but rather to the left side; it was elastic, and not at all painful to the touch." It disappeared on pressure, but was reproduced by coughing, dilating under the effort, like other herniæ. Under exercise a sense of bearing down was produced, as if something would burst its way through the part; and the patient was thus rendered incapable of active exertion. She was recommended to wear a pessary; but did not follow the advice.‡

He mentions two cases of vaginal hernia containing the bladder. In one of these, a girl of seventeen, there was a tumour two inches in breadth, one and a half in depth, just under the meatus urinarius, forcing the anterior part of the vagina through the os externum: pressure was followed by immediate discharge of urine, and the tumour became flaccid. When the urine reaccumulated, the tumour recovered its former size. The complaint seemed to admit of no relief. The other case, precisely similar in its nature, occurred to Dr. JOHN SIMS; who had also met with swellings at the posterior part of the vagina, caused by protrusion of the intestines between that canal and the rectum. In a lady under thirty the posterior part of the vagina was thrust forwards by a swelling passing down between it and the rectum. Its nature, which had not been previously ascertained, was recognised by finding that solid feces could be distinguished in it: when the bowels had been emptied by a clyster, the swelling became soft and yielded to pressure. Although the tumour was large, she continued to have children; but she suffered great inconvenience from a sense of bearing down whenever she used exercise. In an-

* HOIN, *sur les Hernies rares*; BOYER, *Traité des Mal. Chirurg.* tom. viii. p. 376.

† P. 270.

‡ Part ii.; ed. 2, p. 56.

other lady of thirty-five, seen by Dr. SIMS, there was a similar hernia at the back of the vagina, which rendered her incapable of taking exercise unless she wore a pessary. Pieces of sponge were found inadequate to the purpose; and she was obliged to wear a globe pessary, which removed the uneasiness and sense of weight in the part.*

A partial descent of the bladder, which may be called prolapsus rather than hernia, occurs not unfrequently in the puerperal state, more particularly after first labours, when parturition has been protracted and difficult, and the patient has quitted the horizontal position, and exerted herself prematurely and imprudently. A broad, smooth, and soft tumour is felt first within the os externum, under the arch of the pubes; it can be easily pushed up. The vagina is flabby. There is a sense of bearing down, and of fulness when the urine is retained.

Mr. ROBERTON† of Manchester has made some judicious remarks on the subject, both in reference to the causes and treatment of the affection. He refers it to a weakening of the vagina by distension of the canal in parturition, and to the neglect of those precautions, particularly in respect to the horizontal posture, which are necessary for the recovery of the parts. But a state of recumbency is the remedy on which he principally relies. The pessary, which cannot in general be borne, is not necessary while the patient is lying down. If the complaint should have lasted some time, and the vagina is flabby, astringent lotions may be used; the best of these being a scruple of nitrate of silver in eight ounces of water.

Mr. ROBERTON mentions the circumstances of a case, in which such a descent of the bladder interfered with the birth of a child. On the 25th of November he was called in consultation in a case of labour, which had already lasted between forty and fifty hours. He found a large swelling placed transversely in the vagina, under and behind the arch of the pubes. Beyond this swelling, which when grasped by the fingers and thumb poured a stream of urine from the meatus, there was to be felt first a deep suclus, and then, further inward, the flabby lip of the nearly dilated os uteri. The catheter being introduced, a gill of

* *Ibid*, p. 57.

† *Remarks on relaxation and descent of the uterus and bladder in the puerperal state*; in the *Edinburgh Medical and Surgical Journal*, vol. xli. p. 393.

urine was drawn, when the swelling almost disappeared: it was clear that the tumour was caused by descent of the bladder. The delivery was accomplished with difficulty by the aid of instruments, the cervix uteri being extensively lacerated in the process. Severe constitutional disturbance followed, and the patient remained in bed more than a month. At the end of the second month she was beginning to employ herself for her family: at this time nothing unusual could be detected; there was no flabbiness of the vagina, nor any fulness behind the arch of the pubes. In the middle of February she was quite well, excepting some weakness.*

When the uterus falls down to such an extent, as to invert the vagina, the connected bladder is dragged out of its place. This displacement, which is simply consequent on that of the uterus and vagina, constitutes quite a different case from the hernia of the bladder in the vagina, occurring as a distinct and primary affection. In instances of the former kind, of very long standing, stones have been formed in the displaced portion of the bladder, and successfully removed by incision of the tumour.†

Several other cases of vaginal hernia are recorded.‡

PUDENDAL HERNIA.

In the second part of his work, Sir A. COOPER has described, under this name, a peculiar case, very much resembling the vaginal hernia. The parts descend along the surface of the vagina; but, instead of protruding the side of that canal, pass between it and the levator ani, and form a tumour in the middle of the labium pudendi. Such a case resembles the vaginal rupture in its origin, and the perineal in the circumstance of being protruded at the edge, or between the fibres of the levator ani. The situation of the swelling may cause it to be mistaken for bubonocoele;

* *Ibid.* p. 401.

† RUYSCH, *Obs. Anat. Chir.* Amst. 1691; *Obs.* i. tab. i. and in *Thesaur. Anat.* octav. p. 57, tab. iii. fig. iii.; TOLET de la *Lithotomie*; Paris, 1708, chap. xxv. p. 176; DUVERNEY in *Mém. de l'Acad. de Chir.* tom. ii. p. 28.

‡ GUNZ de *herniis*, p. 83, et seq.; DE HAEN *Rat. Medend.* pt. i. cap. vii. p. 87; HOIN *Essais sur différentes Hernies*; Paris, 1768; or in LEBLANC, *précis des Operations de Chirurgie*, p. 459; LEVRET, *des polypes*, p. 154; J. C. STARK de *hernia vaginali*, &c. Jenæ, 1796, 8vo.; STEIN, *Nachgelassene geburtshülfliche Wahrnehmungen*, 1 Th. 1807, No. 22, 23, and 92; CAMPER *Diss. de optima agendi vel expectandi in medicina ratione*, 1776. *The Lancet* for 1831, 1832; vol. i. p. 205.

but the distinction arises from the upper part of the labium being completely free in this case, whereas the swelling of an inguinal hernia extends into the ring. The characters of the tumour possess no peculiarity. Its continuation along the side of the vagina may be felt by introducing the finger into that canal. It should be treated in the same manner as vaginal hernia. The following case is related in Sir A. COOPER's work.

A young woman, aged twenty-two, laboured under the symptoms of a strangulated hernia. A swelling, equal in size to a pigeon's egg, occupied the left labium; it had frequently descended during the last six months, but the patient could reduce it herself with little effort and pain. The tumour was placed below the middle of the labium, the upper part of which, and the abdominal ring, were perfectly free from tumefaction: it could be traced along the side of the vagina, nearly as high as the os uteri. An impulse was felt on coughing. "I then," says the author, "grasped the swelling, and pressing on it with some little force, which gave her great pain, in about three minutes it went up with a gurgling noise, and she became easy. The labium then felt flaccid, as if a tumour had been taken from it, and when the finger was placed in this flaccid and hollow portion of skin, it could be forced back into a circular orifice on the inner side of the branch of the ischium, and between it and the vagina. The only method she has since used to keep the hernia up is to wear a common female bandage between the thighs, and fixed around the abdomen.

Mr. A. BURNS found the bladder protruded both into the vagina and the labia pudendi in the body of an old woman, and had the opportunity of dissecting the parts. He communicated a description of the case to Dr. MONRO, by whom it was published in his *Morbid Anatomy of the Human Gullet, &c.* p. 523. "Having exposed the contents of the abdomen, and removed the small intestines from the pelvis, the urinary bladder was found stretched across the pelvis, with its long diameter directed from side to side. Also in the centre of the pelvis it was so much depressed, that the upper surface of the vagina was forced out between the labia pudendi laterally, the shoulder of the bladder on each side was pulled out into processes, which were traced, descending like horns on each side of the vagina. When the cavity of the bladder was exposed by a

transverse section, it was clearly ascertained that the protrusion had on both sides taken place from that part of the bladder below the angle of reflection of the peritoneum. In this subject, of consequence, there was no peritoneal herniary sac. By insinuating the finger into the cyst on the right side, I found that it followed the direction of the lateral part of the vagina, till at last it was felt lodged in the labium pudendi, very near to the junction of the vulva with the perineum." When the parts had been further dissected, it was found that the tumour passed between the levator ani and obturator internus muscles, pushing the obturator vessels and nerve against the bone, and itself closely embraced by the curved membranous origin of the levator ani; a fact which incontrovertibly proves, that had incarceration taken place, its seat would have been deep in the pelvis.—"The tumour did not, as Mr. VERDIER supposed, burst from between the fibres of the levator ani; it passed freely between that muscle and the obturator internus. It therefore escapes from the pelvis by a very small chink; so the neck of the tumour must always be narrow: but from the looseness of the cellular membrane connecting the muscles, and from the laxness of the texture of the labium, it afterwards expands, and generally in the end forms a Florence flask-like cyst."

An interesting case of pudendal hernia, containing a protrusion of the bladder, is related by Mr. ROBERTON. "Mrs. K——, aged twenty-three, of an active and healthful appearance, two months gone in her second pregnancy, tells me, (Oct. 31, 1831,) that four months ago she discovered, in the right labium, a tumour which was soft, and about the size of a small egg. At the period referred to she was suckling her first child, then ten months old. Says, that the tumour, which has somewhat increased in size, appears in a morning after she gets out of bed, and soon disappears when she lies down at night; also, that its size is much lessened immediately after she has voided her urine. On examining, I detected a soft and slightly elastic tumour, occupying the middle of the right labium, on its inner or mucous surface. Pressure caused it nearly to disappear, and at the same time excited in her the desire to empty the bladder. With my finger I could readily trace the line of descent of the bladder (for the tumour was evidently produced by this viscus) behind the wall of the vagina. This was not an instance of prolapse of the bladder, as commonly

described. Here was no mucous discharge, or flabbiness of the vagina, or perceptible procidentia uteri. The bladder evidently passed in its descent to the right of the median line of the anterior wall of the vagina, and coursed behind the right wall, till it reached the labium of that side. It is remarkable that there were no very urgent symptoms, saving a rather frequent call to make water, with some degree of pain and sense of dragging in the back. In other respects the health was fair, and the patient occasionally walked several miles without much inconvenience. After the reduction of the tumour, which was easily effected, I introduced on different occasions various sizes of the common globular pessary, and always for a time with relief; but sooner or later the bladder slipped past the pessary, and this was sure to be followed by such distress as required the immediate removal of the instrument. I now employed a sponge of moderate size, which was worn only in the day. This kept the bladder from descending into the labium, but when the sponge was removed, I could feel that the bladder was not *in situ*. It had made for itself a nest pretty high up in the right side of the vagina. Since the date of the foregoing report, Mrs. K—— has borne two children. By the employment of the sponge pessary, and perhaps also by the advance of pregnancy, the complaint gradually disappeared. On my attendance in the first labour, subsequent to the appearance of the tumour, I could discover nothing unusual in the vagina, although I made a careful examination. And now, after an additional interval of two years, she believes herself to be entirely free from the complaint.” *

M. J. CLOQUET † saw a pudendal hernia in an unmarried female, twenty-four years old. There was a swelling, equal to a large chesnut, in the right labium, and a prominence, about two inches long, extending from it along the side of the vagina. It was easily reduced, and the patient suffered no return of the complaint, although she employed neither bandage nor pessary. When the parts had been pushed up, a vacuity was perceptible in the labium; and the end of the finger could be pushed into the circular aperture, through which they had descended.

SCARPA ‡ mentions two cases of pudendal hernia, which

* *Edinburgh Medical and Surgical Journal*, vol. xli. p. 400.

† *Observation sur une hernie vulvaire*; Paris, 1821.

‡ *Supplément*, pp. 140 et 142.

had been treated by him. One was an enterocele in an unmarried woman of forty-five; the other a cystocele in a lady who had had one child. The orifice of the sac could be felt in both, by pressing the integuments of the labium inwards with the finger, after the protrusion had been reduced.

Another case of pudendal cystocele is quoted by the French translator of SCARPA* from the *Revue Medicale*, December, 1822.

* *Supplément*, p. 145.

CHAPTER XXIII.

RUPTURE AT THE FORAMEN OVALE OF THE PELVIS.

A CONSIDERABLE oblique notch is observed on the under surface of the horizontal branch of the pubes; and a deficiency exists under this part in the obturator ligament, leaving a sufficient space for the passage of the obturator blood-vessels and nerve. This foramen is larger than would suffice for transmitting the parts: it is formed above by the notch of the pubes, at the sides and below by the margin of the ligament. Protrusions of the abdominal contents have taken place through it, and have been described under the names of obturator or thyroideal hernia.

It seems that the elder ARNAUD* had first noticed this peculiar kind of rupture; and DUVERNEY† afterwards met with it in the dead subject. His observation was communicated to the Royal Academy of Sciences, but is not printed in their Memoirs. On both sides of the pelvis of a female, the peritoneum had been protruded through the openings, at which the obturator vessels pass, so as to form swellings, each of which was about the size of an egg. These contained intestine, were placed between the anterior heads of the triceps, and formed an external tumour. GARENGEOT had become acquainted with the facts noticed by ARNAUD and DUVERNEY; and has related some other cases in his *Mémoire sur plusieurs Hernies singulières*,‡ the first publication in which the existence of the obturator hernia was clearly proved. Besides the case of DUVERNEY, this memoir contains a similar fact noticed by Mr. HOMMEL, of the Anatomical Theatre at Strasburg. He observed

* *Mém. de l'Acad. de Chir.* tom. i. p. 711.

† *Ibid.* p. 714.

‡ *Ibid.* pp. 709—716.

the peritoneum protruded through the obturator holes, and forming swellings equal to pigeons' eggs; and showed the parts to GARENGEOT.* Subsequent experience has so amply confirmed the fact, that no doubt can remain on the subject.

HEUERMANN † found a piece of ileum, equal in length to a finger and a half, protruded at the right foramen ovale of a woman; and preserved the parts. The sac was covered by the first and second heads of the triceps and the pectineus, had acquired the size of a hen's egg, and had caused neither pain nor swelling during life. An entero-epiplocele has been seen in the same situation in a young man seventeen years of age. ‡ CAMPER § and Sir A. COOPER || have seen small protrusions of the peritoneum at the passage of the obturator vessels in the dead subject; and an opportunity once occurred to myself of observing a similar fact. There was a small pouch, capable of holding the last joint of the little finger, on each side of a female subject. In this, as well as in Sir A. COOPER's case, the blood-vessels were behind the sac.

A case is minutely described by M. CLOQUET, ¶ in which a thyroideal entero-epiplocele caused death. It produced no visible external swelling. The tumour was about the size of a small hen's egg, and contained sphacelated intestine and omentum. It was covered by the pectineus and adductor longus, and rested on the vessels and nerve. The parts were deposited in the collection of the Medical Society at Paris. The same intelligent observer states, that these ruptures are more common than has been generally sup-

* *Ibid.* p. 716.

† *Chirurgische Operationen*; Copenh. b. i. § 262, p. 758.

‡ KLINKOSCH, *Dissertation. med. Prag.* vol. i. p. 185; quoted in RICHTER, p. 296.

§ "Memini me in cadavere macilenti senis peritonæi dilatationes, profunde juxta obturantia vasa sinum ingredientes in utroque latere vidisse." CAMPER in *Demonstrat. anatomico-patholog.* lib. ii. p. 17.

¶ VOGEL met with a similar appearance. *Von den Brüchen.*

The nature of the case mentioned by RAVATON (*Traité des plaies d'armes à feu*, p. 306) is doubtful. If it were an obturator hernia, it is an example of fatal incarceration.

Notices of other cases, more or less authentic, may be seen in GUNZ *de herniis*, p. 79 et seq. p. 96; and in LENTIN *Beyträge zur ausübenden arzneymissenschaft*, 1804, p. 42.

|| Pt. ii. p. 70, and pl. xi. fig. ii. The protrusion was very small, and on the right side of a male subject.

¶ *Journal de CORVISART*, tom. xxv.; *Bulletin de la faculté de Médecine*, p. 194.

posed, and that they are more frequent in the female than in the male sex.*

Mr. J. A. SMITH, of Manchester, attended a case of thyroideal hernia, and had the opportunity of examining the parts after death. The patient was an aged unmarried woman of spare habit, who had been ill with pain and insuperable constipation when Mr. S. first saw her. She then experienced pain, which was increased, but not materially, by pressure: the pulse was quick and firm, the mind cheerful. She said that she had experienced similar attacks repeatedly during the last twenty years. She had still desire for food, which she rejected, as well as medicine, a few minutes after it had been swallowed. No hernial swelling could be discovered by the most careful examination. The pain was not limited to any precise situation, and subsided a few days before death. There was no hiccup. The matters ejected from the stomach had the stercoraceous character from an early period of the case. She died twenty-one days after the last fecal evacuation. No traces of inflammation were found in the abdomen. The convolutions of the small intestine were greatly distended; the omentum entirely free from fat; and the arch of the colon reduced to the size of the femoral artery. A knuckle of ileum in a sphacelated condition, and a little fluid, were contained in a peritoneal sac protruded at the notch for the passage of the obturator vessels. The obturatrix artery and vein were on the inner side, and behind the hernia; the os pubis formed its anterior boundary, and its outer and inferior surfaces were closely embraced by the thyroideal ligament.†

In the cases now enumerated, the complaint was not discovered until after death; and, when we consider how the tumour is surrounded by the muscles of the thigh, we shall not be surprised at finding that it has caused no external swelling, nor ever exceeded a small size. The pectineus, the long and middle heads of the triceps, and the gracilis, completely inclose the space into which the sac protrudes, and must, by their pressure, prevent it from increasing to any great bulk. These circumstances of anatomical position would undoubtedly lead us to suppose that the complaint could never be recognised during life. Yet we are informed by GARENGEOT, that ARNAUD had reduced

* *Recherches Anat.* p. 87.

† *LANCET*, 1829, 1830, vol. ii. p. 735.

several obturator herniæ, and kept them up by bandages ; that he himself had seen and reduced two such ruptures in the living subject ; and that two other instances had been communicated to the Academy. The careful perusal of these facts has not satisfied me that they were obturator herniæ.*

* I cannot think that the two cases mentioned by ESCHENBACH were, as he represents them, ruptures through the foramen ovale. *Observata anatomico-medico-chirurgica rariora*, 1769, p. 265, et seq.

CHAPTER XXIV,

ISCHIATIC RUPTURE.

A FEW cases are recorded, in which ruptures have occurred at the great sacro-sciatic foramen of the pelvis. Since the sac is covered at this point by the gluteus maximus, it could not be perceptible externally, until it had acquired a considerable size; and the resistance of the muscle would probably oppose its increase. Hence we do not find that it has ever been recognized in the living subject. *

* An exception must be made to this remark, if we admit, according to the general opinion, that the case, described in PAPEN'S *Epistola de stupenda Hernia dorsali*, was an ischiatic rupture. A woman at the age of forty, perceived near the right side of the anus a small tumour, which gradually increased into an immense pendulous bag, hanging down to the knee. She was obliged to lie on the left side, to suspend the tumour from the back when at work, and to elevate and compress it in order to promote the evacuation of the feces. Frequent borborygmi were heard in the part. It seems that this great infirmity did not materially affect the patient's health, nor prevent her from following laborious occupations, as she died suddenly while employed on harvest work, and her body was very fat. The swelling resembled an oblong flask, narrowest towards the anus, and increasing below. Its length was an ell, and the circumference of the lower part half an ell. It formed a cavity lined by peritoneum, and containing all the small intestine, with part of the large, and of the omentum. The course of the stomach described a perpendicular line, and the pylorus was at the entrance of the sac in the pelvis. The opening, at which the parts protruded, is by no means clearly described. The circumstance of the swelling having been perceptible when small, of its situation near the anus, and of its increase to so great a bulk, make me doubt whether the parts had passed out at the sacro-sciatic foramen. HALLERI *Disput. Chirurg.* tom. iii.

The preceding case, and an analogous instance recorded by BOSE, (*Programma de Enterocoele ischiadica*; Lipsiæ, 1772,) are regarded by SCARPA as examples of perineal hernia. *Supplément*, p. 149.

I am equally doubtful respecting the instance cursorily mentioned by LASSUS, and considered by him to have been an ischiatic hernia. The tumour was of the size of a fist; had not been attended with any troublesome symptoms,

BERTRANDI* had seen the ileum protruded on the right side in two instances; and BOSE† mentions, that the small intestine was protruded in a case, which came under his observation. CAMPER‡ met with an example on the left side of the female pelvis. The opening of the bag was narrow, and the fundus considerably larger: it contained the ovarium, which was larger than usual. The finger introduced into the sac could be felt distinctly on the outside, notwithstanding the thick external coverings. A case, in which fatal strangulation of the small intestine took place in the same situation, is recorded in Sir A. COOPER's work. § The swelling was small, and its existence not suspected during the patient's life.

and was cured by trusses and lying in bed two months. *Pathologie Chirurgicale*, tom. ii. p. 103.

The following case is mentioned so shortly, that it also must be classed among the doubtful instances. "My father had occasion to visit a child with a large tumour under the glutei muscles, which became tense when the child cried, owing to the tumour containing a large portion of intestine." MONRO, *Morbid Anat. of the Human Gullet, &c.* p. 380.

* *Mem. de l'Acad. de Chir.* tom. ii. p. 2, note a.

† *Programma de enterocoele ischiadica.* Lips. 1772.

‡ *Demonst. anat. pathol.* lib. ii. p. 17.

§ Pt. ii. p. 73; plates xii. xiii.

CHAPTER XXV.

HERNIA OF THE DIAPHRAGM.

A MALFORMATION of the diaphragm, consisting of a preternatural fissure, forming a communication between the thoracic and abdominal cavities, has, in many instances, allowed the viscera of the abdomen to pass into the thorax. Such an occurrence will interfere with respiration in proportion to the magnitude of the protrusion, and will disturb, more or less seriously, the intestinal functions, at the same time that it exposes the patient to the risk of fatal strangulation.

These ruptures are much more frequent on the left than the right side; a difference which the situation of the liver, and its close apposition to the right concavity of the muscle, readily account for. Where, however, the opening in the diaphragm is considerable, the whole liver has been found, in a newly-born child, in the right cavity of the chest: * and a smaller slit, giving passage to less considerable protrusion, has been seen on the right side of the diaphragm in the adult.†

The muscular portion is the usual seat of the fissure; it has been seen less frequently in the tendinous fibres; and

* MACAULAY in *Medical Observations and Inquiries*, vol. i. art. iv. case ii. ; VICQ D'AZYR in *Mémoires de l'Acad. des Sciences*, 1772, pt. ii. page 81.

† BONN, *Descriptio thesauri ossium morbosorum Hoviani*; No. cciv. p. 69. The opening was near the gall-bladder; and the protruded parts consisted of colon, with nearly the whole omentum. BOWLES in *Medical Records and Researches of a private Medical Association*, p. 14. The protrusion was on the right side of the ensiform cartilage.

protrusions have occurred still more rarely at the opening which transmits the œsophagus.*

In many cases, the diaphragmatic hernia is congenital: a large portion of the abdominal viscera is found in the chest at the time of birth, and the child dies soon after. †

Sometimes the parts pass occasionally into the preternatural opening, causing indigestion, nausea, colicky pains, anxiety, difficulty of breathing; and return again. In the intervals of such attacks the patient is well, and capable of active exertions. Strangulation occurs ultimately and proves fatal. ‡ Violent vomiting, coughing, or other efforts will cause protrusion, as in ordinary cases of hernia. A rupture of the diaphragm§ from fractured ribs, or other accidents, may allow the abdominal viscera to pass into the chest.

The stomach, colon, omentum, spleen, and left lobe of the liver, are the parts most frequently protruded; the

* FANTONI *de Observat. med. et anat. Epist.* 1714, Epist. 23. The stomach and a part of the omentum had passed into the chest. See also *Ephem. nat. cur.* cent. iii. and iv.; App. p. 147. ST. ANDRE' mentions that he found the parts strangulated in a fatal case near the passage of the great sympathetic nerve. The description, however, does not enable us to form a clear opinion of the real nature of the case. *Philos. Transact.* vol. xxx. No. cccli.

† HOLT in *Philos. Transact.* vol. xxii. No. cclxxvii. p. 992. The child lived two months; STAEHELIN in HALLER, *Diss. Anat.* vol. iii. No. iii; MACAULAY, *Loc. cit.*; KLEIN, *Diss. sistens monstrorum quorundam descriptionem*; Stutgard, 1794, Case iv; VETTER *Aphorismen aus der practischen anatomie*, p. 144; COOPER on *Crural and Umbilical Hernia*, p. 76; SOEMMERRING *Ueber die Ursache Erkenntniss und Behandlung der Brüche am Bauche und Becken*, p. 12; HALLER, *Elem. Physiol.* tom. vi. p. 118; VAN GEUNS in *Transactions of the Dutch Society*, &c. tom. viii. pt. i. p. 171; SANDIFORT *Obs. Anat. Patholog.* lib. iv. cap. v. p. 48, note p; FOTHERGILL in *Philos. Trans.* vol. xlv. No. cccclxxviii: or in his *Works*, vol. i. This child lived ten months; and its symptoms are minutely detailed. VICQ D'AZYR, *loc. cit.*

‡ RIVERIUS, *Obs. Med.* cent. iv. obs. lxxvii. The case of a youth twenty-four years old, who had experienced no inconvenience during his life. Protrusion was caused by an emetic. MORGAGNI *de caus. & sed morbor.* Epist. liv. art. xii. and xiii.; LIEUTAUD, *Histor. Anatomico-Med.* tom. i. obs. cccxii. &c.; LODER, *Programma, obs. herniæ diaphragmatis*, Jenæ, 1784; HALLER, VAN GEUNS, SANDIFORT, VETTER, *locis citatis*; BARTHOLIN *Histor. Anat. Var.* cent. vi. hist. lv.; JAGWITZ in *Act. Berolinens.* Dec. ii. vol. iv. obs. i.; PETIT, *Traité des Malad. Chirurg.* 2nd edit. p. 229, et suiv.; CLARKE, in *Transactions of a Society for the improvement of Medical and Chirurgical Knowledge*, vol. ii. art. viii.; BAILLIE'S *Engravings*, fascic. iv. pl. viii. fig. i.; CHAUVET in *Mém. de l'Acad. des Sciences*, 1729, p. 11; MONRO on *Crural Hernia*, p. 10.

§ AMBR. PARÆI, *Opp.* 1594, lib. ix. cap. xxx. p. 308; FAB. HILDANUS cent. ii. obs. xxxiii; MUYS, *Prax. Med. Chir.* dec. v. obs. ii.; KIRSCHBAUM *Diss. de Hernia ventriculi* in HALLER *Diss. Chir.* tom. iii. p. 218; PLENK, *Sammlung von Beobachtungen*, 1. theil.; DERRECAGATX in DESAULT *Journal de Chirurgie*, tom. iii. art. ii.; COOPER on *Crural and Umbilical Hernia*; p. 80; MONTEGGIA, *fasciculi pathologici*, Mediolan. 1789, p. 99; WHEELWRIGHT in the *Medico-Chirurgical Transactions*, vol. vi. p. 374.

small intestine, and the whole liver, have also been found in the chest. The viscera lie in the cavity in contact with the lungs, and the edges of the opening which transmits them are smooth, the peritoneum and pleura being united at the fissure. Instances, however, are recorded, in which the protruded parts were contained in a membranous sac, formed by the two serous membranes just mentioned.* In such a case, there could not have been any natural fissure in the diaphragm; the parts must have been urged between the fasciculi of that muscle, where they were weaker, or more loosely connected than usual. We can easily understand how the peritoneum would yield to the pressure of the viscera, so as to form a sac for them, as it does in other herniæ; and it is also clear, that this peritoneal sac must be covered towards the chest by the pleura. Both these membranes, however, are too firmly connected to the diaphragm to admit of their yielding to any great extent.

Of the patients, in whom diaphragmatic herniæ have been found after death, many had been subject during life to occasional attacks of pain in the left side of the chest, cough, dyspnæa, and various indications of disordered stomach and bowels. We may hence conclude that portions of the abdominal viscera passed occasionally into the thorax, and returned to their natural position.

In some instances the protruded parts have been found adherent, so that they must have remained permanently in the chest; the functions of the thoracic and abdominal contents having been less seriously disturbed than might have been expected. Evidence to this effect is afforded

* BOWLES in *Medical Records and Researches*, p. 15; PETIT, lib. cit. p. 233: he says that the protruded parts (stomach, colon, and omentum) were contained in a sac, formed of a "prolongation du péritoine, du diaphragme et de la plevre ensemble, sans aucune rupture dans les membranes, ni aucun écartement dans les fibres musculieuses et tendineuses du diaphragme." BECLARD in *Supplément au traité de SCARPA*, p. 132; a case of two diaphragmatic epiploceles, in which the sacs were formed by the pleura and peritoneum inseparably united. The parts are represented in pl. xx. and xxi.

PROFESSOR BIGNARDI of Modena has published a case of diaphragmatic hernia, in which the protruded parts were contained in a hernial sac formed of the peritoneum and pleura. The mouth of the sac was situated behind the right edge of the ensiform cartilage and the cartilage of the right seventh rib; it measured one inch by one inch and a half. The sac, which contained a mass of omentum, and a portion of the transverse colon with its appendices epiploicæ, not adherent nor strangulated, lay in front of the lung. *Sull'ernia diaframmatica*; with a figure. Modena, 1827. An account of the case is given also in FRORIEP's *Notizen*; vol. xx. p. 175.

principally by the cases, in which external injury has been the source of the mischief.

CASE.—A carpenter, thirty-nine years old, fell from a considerable height. At the end of six months he was able to resume his ordinary occupations, but was still troubled with difficulty of breathing, dry cough, pain on the left side of the chest, and frequent nausea. Fifteen years after the first accident, he again fell from a height of twenty feet, broke the seven lower ribs on the left side, and died three days after. The stomach and transverse arch of the colon were found in the left cavity of the pleura, having passed through a round opening in the tendon of the diaphragm, two inches and a half wide, with an edge of two or three lines in thickness. The omentum adhered to the edge of this opening on the thoracic, and the spleen on the abdominal side. The great curvature of the stomach was turned upwards towards the mediastinum; the arch of the colon adhered on one side to the small curvature of the stomach, and on the other to the diaphragm. This muscle had been torn from the ribs, towards the left, for a space of three inches, and another portion of the colon had passed into the chest through this new laceration.*

CASE.—MR. GREETHAM, of Portsea, was called to a thin muscular man, between thirty and forty years of age, with an attack of agonising pain in the belly, and vomiting. The bowels became costive, stercoraceous vomiting came on, no stools could be procured, and death ensued in fifteen days under circumstances clearly indicating internal strangulation. Some years previously he had been seriously wounded by a broad-pointed knife thrown at him in a drunken frolic: this entered the body on the left side, between the fifth and sixth ribs, and penetrated to a considerable depth. He was taken to Guy's Hospital, where a piece of lung protruding from the wound was cut off. From the time of his recovery he had been subject to spasms in the region of the stomach; he had, however, made several voyages to India, as the steward of a ship. No appearance of omentum was found in the abdomen. The intestines were inflamed. The large curvature of the stomach was drawn up and fixed to the left side of the diaphragm, as was the transverse arch of the colon distended to three times its natural size. In the lower part of the left

* DESAULT, *Journal de chirurgie*, tom. iii. art. 2.

pleura lay an immense mass, which proved to be the whole omentum perfectly condensed, which had passed through the tendinous part of the diaphragm, pulling up the large curvature of the stomach, and keeping it fixed in an inverted position. The whole was attached by firm and old adhesions to the orifice in the diaphragm; a portion of the colon was also engaged in the opening, and firmly constricted.*

CASE.—A patient, fifty-four years of age, was received into the Bristol Infirmary with a fracture of the leg, which was proceeding favourably until the seventh day, when delirium came on, with prostration of the vital powers; and death speedily ensued, the symptoms at last being much like those of enteritis. This person had received a violent blow on the back, thirty-eight years before, from the fall of a tree, and had not enjoyed good health since that time, often suffering from asthmatic dyspnæa, dyspepsia, and constipation. He had, however, always been able to follow his employment. It was found after death that the whole stomach, nine feet of the small intestine, four feet of the colon, and the omentum, had passed into the left pleura through an aperture in the diaphragm of circular form, three inches and a half in diameter, with smooth edge, situated in front and to the left of the œsophageal opening. The œsophagus entered the abdomen in the usual manner, and immediately turned back to terminate at the cardia, which lay within the chest. The stomach, greatly distended by flatus, was behind the other viscera, with its great arch towards the neck, and the pyloric extremity, like the cardiac, close to the orifice in the diaphragm. The omentum was connected to the pleura near the clavicle by old and firm adhesions: when these had been divided, all the protruded parts were readily drawn down into the abdomen. There was no stricture on the protruded parts: indeed the hand could be readily passed between them and the sides of the opening. The left lung was close to the spine, condensed into a size not larger than the spleen: the heart was pushed over to the right of the mediastinum. The right lung was unusually small and dense. In other respects the thoracic and abdominal viscera were healthy.†

The symptoms of diaphragmatic hernia, whether reducible or strangulated, are analogous, so far as the protruded

* *London Medical Gazette*, vol. x. p. 43, with a wood cut.

† *Ibid.* vol. xii. p. 673.

parts and their connexions are concerned, to those of other ruptures. At the same time, the presence in the chest of a preternatural swelling, generally of considerable magnitude, disturbs more or less seriously the functions of the respiratory organs. There is, however, nothing characteristic, either in the abdominal or the thoracic symptoms, or in their combination, so that we have no means of distinguishing the affection during life. Among the numerous recorded instances, I believe that there is not one in which the nature of the malady was even conjectured before the patient's death. Practically, this is a matter of little regret, as the circumstances preclude all hope of relief from an operation, or any other manual proceeding.

CHAPTER XXVI.

INTERNAL HERNIÆ; STRANGULATION OF THE BOWELS
WITHIN THE CAVITY OF THE ABDOMEN.

OF the cases considered in this chapter, the majority do not fall properly under the description of ruptures; as the viscera are not protruded from the abdomen, but constricted or strangulated within the cavity. The subject is not of much practical importance, since the presence of the affection is not indicated by tumour or other external signs; it may indeed be conjectured from the symptoms, but it can only be ascertained by examination after death. Hence there is little or no chance of affording effectual relief.

When the rupture has been returned in a mass, by the taxis, (see *ante*, p.92,) or when the parts have been pushed back through the tendinous openings, in operations, without the stricture having been previously removed, (see *ante*, p. 504,) the case may be considered as an internal strangulation. Here the evil may admit of remedy, if the surgeon should detect its nature. The proper course of proceeding under such circumstances has been already considered; see *ante* p. 149—153.

Membranous cords forming adhesions frequently cause strangulation. They may be attached to any part of the cavity, or of its contents. The appendix vermiformis, the FALLOPIAN tube, the omentum and diverticula of the small intestine, when fixed at their loose extremities to some neighbouring part by such adhesions may cause death in this way.* I have seen several examples of such occur-

* *Giornale di Medicina*, tom. i. p. 91; AMYAND, *Philos. Trans. abridged*, vol. ix. p. 124. *Journal de Médecine*, tom. xxxii.; GARTHSHORE, in *Med. Obs. and Inquiries*, vol. iv. p. 223; MOSCATI, in *Mém. de l'Acad. de Chir.* tom. iii.

rences. Two of the loose viscera, becoming preternaturally adherent, may circumscribe a space, in which a portion of the alimentary canal may be strangulated.

Sacs are sometimes formed in those processes of peritoneum, which consist of two layers; as the mesentery, mesocolon, the process belonging to the sigmoid flexure of the colon, and the ligamentum latum uteri.* Of the two latter I have myself seen instances. It is said that intestine has passed into the foramen or hiatus of WINSLOW, and has thus become strangulated in an opening of the mesocolon.†

Again, portions of the alimentary canal have become strangulated in preternatural openings of the omentum, mesentery, or mesocolon.

The symptoms of these affections are the same as those of strangulated ruptures. There is, first, disorder of the stomach and bowels, with uneasiness or pain in various degrees, and costiveness. Sickness soon comes on. The alimentary canal above the stricture becomes distended, and thus inflammation is excited, which extends sooner or later over the cavity generally, and destroys the patient, the constipation having been insuperable, and the vomiting ultimately stercoraceous.

The violence of the symptoms, and their rate of progress, vary much in different instances. They sometimes come on gradually, and advance very slowly, the case appearing to be one of mechanical obstruction, and being attended with an almost indolent enlargement of the abdomen. In other instances, the close pressure of the stricture excites active peritonitis and enteritis; the inflammatory symptoms are strongly marked, and the case proceeds rapidly to a fatal termination.

As the exciting cause of the mischief is not indicated, in these cases, by any characteristic symptoms, they are considered and treated as examples of ordinary peritonitis and

p. 468; LA PEYRONIE, *ibid.* tom. i. p. 337; KLOECKHOFF, in *Haarlemische Abhandlungen*, vol. xii. No. viii.; BORDENAVE, *Hist. de l'Acad. des Sciences*, 1779, p. 8; MEYER, *de strangulationibus intestinorum in cavo abdominis*, Argent. 1776; HEY's *Practical Observations*, p. 232; VAN DOEVEREN, *Specimen Obs. Acad.* c. v. MONRO on *Crural Hernia*, p. 13; COOPER on *Crural Hernia*, p. 85 et seq.; A. K. HESSELBACH, *Lehre von den Eingeweide-brüchen*, 1. 22.

* DE HAEN, *Rat. Medendi*, pt. xi. cap. iii. § ii.; KNOBLOCH, *Diss. de Entero-Mesocolocele*, Lugd. Bat. 1797; MONRO On *Crural Hernia*, p. 12; COOPER, *lib. cit.* p. 82 et seq.; CALLISEN, in *Act. Soc. Med. Hafniens.* vol. ii.; DE WITT, in *Abhandlungen der Gessellschaft zu Vlissingen*, 1r. theil.

† JOBERT, *traité des maladies chirurgicales du canal intestinal*, tom. i. p. 522.

enteritis. The real nature of the malady is not suspected until it has lasted for some time, and more especially from the combination of obstinate constipation with fecal vomiting.

The appearances on dissection are the same as those observed in patients who die of strangulated hernia. See *ante*, p. 57.

As the disease, if left to itself, is inevitably fatal, it has been suggested that an attempt to afford relief, however hazardous and unpromising, would be justifiable. Hence the proposal has been made to open the abdomen at the supposed seat of obstruction, for the purpose of liberating the intestine. If this could not be accomplished it has been said that we might make an opening in the bowel, and endeavour to establish an artificial anus.

The operation was performed in one instance by BARON DUPUYTREN, who opened the abdomen by an incision in the linea alba. The strangulation was not discovered, and the patient died. It is stated that the operator wished to have made the incision where the patient experienced the greatest suffering; but that he was overruled; further, that, according to the appearances after death, if DUPUYTREN had taken his own course in the operation, the stricture would have been discovered and might have been easily removed.*

I can hardly imagine a combination of circumstances, in which this kind of operation would be advisable. In the majority of cases the existence of internal strangulation is merely conjectural; and there are none, in which the symptoms indicate either the nature or the precise seat of the obstruction. The latter is sometimes of a nature not to admit of removal, even if we should be fortunate enough to discover its exact situation. It may happen occasionally that the patient experiences pain in a certain spot; while this fixed suffering may be combined with local changes, such as swelling, and induration, affording a strong presumption as to the seat of mischief. Would even these circumstances justify the operation of making a large wound in an inflamed abdomen freely exposing its contents, and subjecting a large portion of the inflamed viscera to a tedious handling and probably to other more violent proceedings? Could a patient, whose vital powers were almost ex-

* JOBERT; *Ibid.* p. 581.

hausted by peritonitis and enteritis be expected to survive this additional infliction?

Thus, the danger of the proposed operation is certain, and so great that it cannot be overrated; the existence of internal strangulation in any given case is quite uncertain, and the power of removing the obstruction, even if it were discovered, somewhat doubtful. Again, in some cases apparently desperate, spontaneous recovery takes place when our treatment has been unavailing. I have seen a patient recover after constipation of six weeks' duration.

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